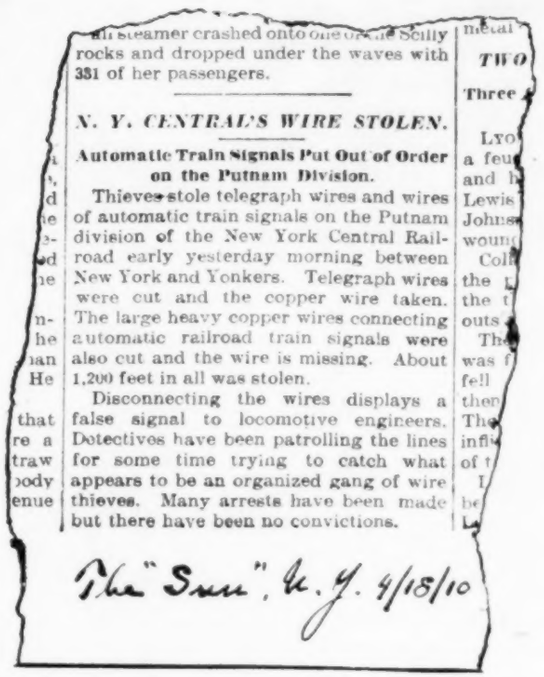
TELEPHONE ENGINEER

Vol. III CHICAGO, MAY, 1910 No. 5

Copper-Clad Steel wire has been stolen from just two of the railroads now using it.



all steamer crashed onto one of the Scilly rocks and dropped under the waves with 331 of her passengers.

N. Y. CENTRAL'S WIRE STOLEN.

Automatic Train Signals Put Out of Order on the Putnam Division.

Thieves stole telegraph wires and wires of automatic train signals on the Putnam division of the New York Central Railroad early yesterday morning between New York and Yonkers. Telegraph wires were cut and the copper wire taken. The large heavy copper wires connecting automatic railroad train signals were also cut and the wire is missing. About 1,200 feet in all was stolen.

Disconnecting the wires displays a false signal to locomotive engineers. Detectives have been patrolling the lines for some time trying to catch what appears to be an organized gang of wire thieves. Many arrests have been made but there have been no convictions.

The "Sun", N. Y. 4/18/10

In both cases the thieves were caught immediately, because the wire was Copper-Clad

Copper-Clad

TRADE MARK

Duplex Metals Co.

149 Broadway

New York

WESTON—PORTABLE DIRECT CURRENT
INSTRUMENTS *for*
ELECTRICAL TESTING SERVICE

MODEL I.
Portable ***Standard*** *Instruments. Highest grade for Portable Testing service.*

MODEL 45.
Good Portable Testing Instrument for service where the extreme accuracy of Model I is not required.

MODEL 56.
Duplex Portable Testing Instrument. Voltmeters and Ammeters in one case.

MODEL 5.
Highest grade ***Laboratory Standard*** *Instruments for the most accurate laboratory service.*

Send for catalogue and complete information to

WESTON ELECTRICAL INSTRUMENT COMPANY

NEW YORK OFFICE, 114 Liberty Street — **Waverly Park, NEWARK, N. J.**
LONDON, Audrey House, Ely Place, Holborn — **BERLIN, Ritterstrasse 88.**

Tells the Whole Story about

MICA FUSES

Do you know when to use a one-fourth ampere fuse and when to use a one ampere fuse?

Can You Tell Them Apart?

Do you know why a fuse is perfectly reliable in one place and quite dangerous in another?

BULLETIN No. 325

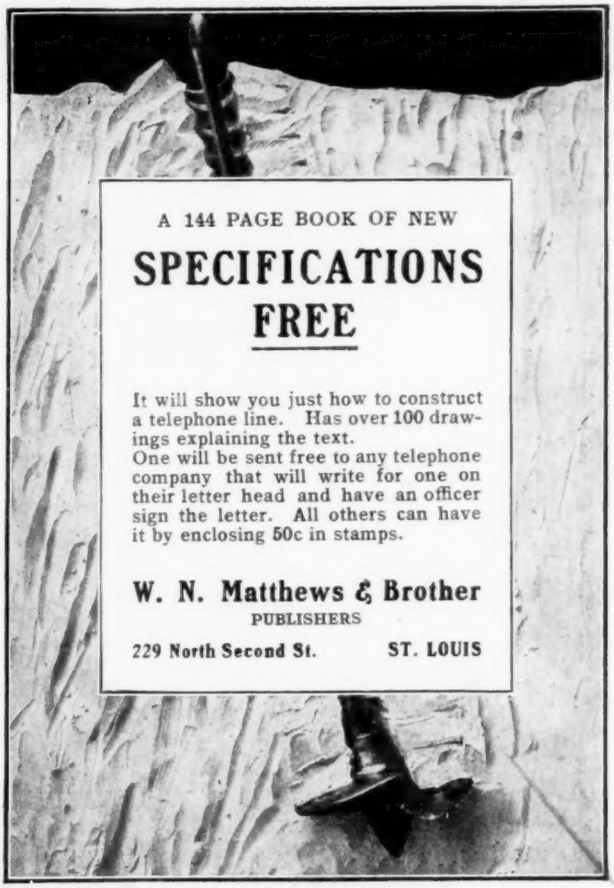
answers these questions and many others which come up every day.

Get a copy before they are gone.

AMERICAN ELECTRIC FUSE CO.

Dept. F. **MUSKEGON, MICH.**

Atlanta Birmingham Chicago Cleveland Denver New York
Philadelphia Pittsburg St. Louis San Francisco Seattle


A 144 PAGE BOOK OF NEW
SPECIFICATIONS
FREE
It will show you just how to construct a telephone line. Has over 100 drawings explaining the text.
One will be sent free to any telephone company that will write for one on their letter head and have an officer sign the letter. All others can have it by enclosing 50c in stamps.
W. N. Matthews & Brother
PUBLISHERS
229 North Second St. ST. LOUIS

TELEPHONE ENGINEER

VOL. III | CHICAGO, MAY, 1910 | NO. 5

PUBLISHED MONTHLY BY THE

ELECTRICITY MAGAZINE CORPORATION

MONADNOCK BUILDING, CHICAGO.

ED J. MOCK and PAUL H. WOODRUFF, Editors.

LONG DISTANCE TELEPHONE: HARRISON 3014.

EUROPEAN OFFICE.....36 Maiden Lane, Covent Garden, London
S. RENTELL & Co., Representatives.

Entered as second-class matter May 26, 1909, at the postoffice at Chicago, Illinois, under Act of March 3, 1879.

TERMS OF SUBSCRIPTION.

United States, Cuba and Mexico.....Per year, $2.00
Canada.....Per year, 2.50
Foreign countries within the Postal Union.....Per year, 3.00
Single Copy..... .20

DISTRIBUTING AGENTS: The Western News Company and its International Branches.

NOTICE TO ADVERTISERS.

Changes of advertising copy should reach the office of publication not less than ten days in advance of date of issue. Regular date of issue, the first day of each month. New advertisements will be accepted up to within five days of date of issue, but proof of such advertisements can not be shown until the appearance of the edition containing it.

NOTICE TO SUBSCRIBERS.

REMITTANCES.—Remittances should be made by check, New York draft or money order, in favor of TELEPHONE ENGINEER. Foreign subscriptions may be remitted direct by International Postal Money Order, or sent to our London office.

CHANGE OF ADDRESS.—The old address should be given as well as the new, and notice should be received two weeks in advance of the desired change.

DATE ON WRAPPER indicates the month at the end of which subscription expires. The sending of remittances for renewal prior to that date will be much appreciated by the publisher.

CLUB RATE.—In acknowledgment of assistance rendered by subscribers in the securing of new orders, a club rate of $1.50 per annum is quoted. This rate applies to new subscriptions in clubs of two or more.

Copyrighted, 1910, by ELECTRICITY MAGAZINE CORPORATION.

CHICAGO, MAY, 1910.

TABLE OF CONTENTS

Editorial 197-200
Devastating Sleet Storm. By Frank McGill Carson.....201-205
How to Read Telephone Circuit Diagrams. By David S. Hulfish....205-209
New York Commission Bill..... 210
Making Rubber Covered Wire..... 210
Construction Versus Destruction. By Harry H. Gerhard.....211-214
What One Woman Thinks. By Sarah Elizabeth Brown.....215-216
Forecasts by Telephone..... 216
Who's Who in the Telephone Game.....217-218
Independent Situation in Chicago..... 218
Mine Telephones. By E. O. Munson.....219-220
Florida Convention 220
Report of Wisconsin Commission.....221-222
Hearing on Boston Rate Revision..... 222
Department of Railway Telephones.....223-230
Recent Telephone Patents. By David S. Hulfish.....230-231
Of Interest to the Trade.....232-236
Advance in the Art of Soldering..... 232
Western Electric New Mine Telephones..... 232
Kellogg Bulletins 233
Lorimer Lundquist Automatic Claims..... 234
Wood-Preserver Geneological Tree..... 234
New Telephone Mouthpiece..... 235
New Book from Matthews..... 234
New P. B. X. and Other Bulletins..... 235
New American Electric Fuse Catalogue..... 236
New Stromberg-Carlson Pamphlets..... 236
Brevities of the Business.....236-242

BUY NOW!

YOU have probably complained more than once of the constantly increasing cost of living. Perhaps you have read the learned dissertations on that subject which the newspapers have been publishing, and have discovered—though you knew it all the time—that butter, potatoes, meat, clothing, lumber and labor are more expensive by ten to a hundred per cent than they were a decade ago.

As a purveyor of telephone service, you may have lamented the fact that rates have not kept pace with the upward tendency of things in general. You marvel at the ease with which the butcher and the tailor, and even the laborer get theirs; while any suggestion of raising your rates is met by a prompt howl of dissatisfaction. It is only when you buy that you notice the augmentation of the "costoliving." When you sell, why "that's something else again, Mawruss," as Montague Glass would say.

But speaking of buying, have you bought any equipment recently? Have you noticed the increased cost of telephone apparatus? No, you haven't. There isn't any. Telephone equipment is as cheap today as it ever was; cheaper, because it is better.

All things considered, telephone apparatus is one of the cheapest commodities on the market today. Its cost of production has increased in all due proportion; its quality has increased with the development of the art and with the improvement of manufacturing machinery, engineering facilities and systematic organization. But the improvement has come largely through the manufacturers' pocket. The day is past when a new telephone manufacturer can enter the field and amass a fortune in a few years. Some of the older manufacturers have even been called upon to put back into the business some of the profits they took out of it a few years ago. Yet they go on selling at the same old prices just because you are accustomed to buy at those prices; and, under ordinary circumstances, the buyer, or the market, determines the price.

How much longer do you think present conditions will continue? Remember that the telephone manufacturing business is still lacking in the finer details of systematization and the proper classification of its product, as compared to many industries of far less commercial importance. The evolutions of the telephone market during the past few years are even now forcing a rearrangement of selling methods, and that can eventually mean nothing but a rearrangement of prices.

Telephone equipment will never be any cheaper than it is now. It will not be as cheap as it is now for very long. The moral is: Buy now! Buy whether your immediate needs demand it or not. It does not require much engineering to determine just what new

equipment you may reasonably need in the next year or two; if you are close to your business you know already. Buy that equipment. Some day soon your fellow operators will be grumbling because telephone apparatus, like everything else, has "gone up." You can listen with a smile while you pat yourself on the back if you Buy Now!

SAVING THE LOST CALLS

IN long-distance work a great deal of attention is given to saving those calls which, without careful nursing, would be lost because of the absence of the called party. Of course, the remuneration for a long-distance call justifies this extra attention from a purely commercial standpoint. Toll rates are calculated so that, in the aggregate, they take care of a certain proportion of extra effort, even if that effort prove fruitless.

There is not the same incentive to endeavor to save the local call which fails of its purpose because the called party "don't answer," or because the called line is busy and the call is not repeated. With unlimited service the subscriber may well be expected to take care of his calls to the extent of repeating them when necessary. And even with measured service, the operating toll of five or three cents is not sufficient to cover any additional or special supervision such as would be necessary for the recording and reporting of lost calls.

But the purely commercial value of this phase of operating is not the only one to be considered. The subscriber, either on unlimited or measured service, whose call is not completed for any reason, has no just complaint, for he is out nothing through the failure. But his needs have not been satisfied, and he humanly blames the telephone—not the company's service, necessarily, but what he considers shortcomings of the instrument. Then if he forgets to repeat the call, or grows weary of trying unsuccessfully to get his party, his dissatisfaction increases. Furthermore, the memory of the attempt lingers unpleasantly; he is likely to say to any convenient listener, "I've been trying for two hours to get a connection through this blamed telephone!"

The solution of the difficulty is a little difficult with the unlimited service customer. Inasmuch as he generally uses his telephone with a view to getting his money's worth out of it anyway, there is little temptation to offer him even more service than he demands and, to the best of his ability, exacts. With the measured service customer the case is comparatively simple. When a call from such a subscriber is not completed the company loses its toll. This charge would be saved in many instances if the company would assume the task of notifying the called party of the call as soon as the line was clear or an answer could be obtained. This, of course, would be done with the permission of the calling party and the understanding that charge would be made for a completed call.

The most valuable form of notification to the called party would include the name of the calling party. For example, Smith calls Brown several times, getting the busy-back each time. He could then say to the operator, "Tell 2300 A. B. Smith called," and the message would be delivered in that form as soon as the line was clear. If the obstruction was a "don't answer," instead of a busy-back, more work would devolve upon the operator, as several attempts might have to be made before gaining a response. This would be the more valuable form of service of the two, however, because it is already the practice of a number of companies to call back on a busy call as soon as the line is cleared, when the calling party requests such service; while a large proportion of "don't answer" calls are wholly lost under present methods.

The simplest form of notification to the called party would be merely the telephone number of the calling party. Such a message as delivered by the operator would be, for example, "2300 called you." The disadvantage of this form is that unless the called party is familiar with the number, or has recourse to a numerical directory, the information is of little value to him. He hesitates to assume the charge for an investigating call, however slight that charge may be, knowing that the result may be annoying rather than edifying.

This difficulty would be solved by a numerical directory. Such directories are issued by a number of operating companies, and although the size such a volume would assume in one of our larger cities would make its free distribution impracticable, a price could well be set upon it sufficient to cover its cost. It is so desirable to the average subscriber it is strange that it has not found greater use. Used in connection with the saving of lost calls, it would aid in increasing both the tolls and the efficiency of any operating company, and would eventually result in making telephone service more popular and less criticised than it is now.

THE P. B. X. OPERATOR

THE operating company is not responsible for the p. b. x. operator. If it was, it is to be feared that a good many of her would lose their jobs. The little boss of the private board can cause more trouble and occasion more exasperation among customers in a day than any other employee of a business house can in a month.

Her true function is that of reception lady. She it is who must greet those who would enter the open door of the telephone—her employer's widest portal. Telephonically (and who shall limit the vastness of that adverb?) she represents The House. Her indifference is its indifference; her discourtesy, its discourtesy. In her impregnable armor of femininity and inaccessibility, she is absolute suzerain of the door. She is superior to her rules of order, for she were not a woman could she not administer rebuke or convey contempt without recourse to mere words. She has even her employer and his fellows at her mercy, for when she reports a trunk busy or a party unavailable, what can they do but swear at the perversity of the telephone?

Employers of p. b. x. operators do themselves great benefit when they insist that every applicant for the place show experience with an operating telephone company. The strict discipline of the operating room works wonders in sweetening the disposition and humbling the hauteur of the debutante in business life, and those who graduate from its influences are apt to make good at whatever they attempt, from bossing a p. b. x. board to housekeeping.

Hundreds of concerns, whose very act in installing private switchboards proves the importance of the

telephone to their business, delegate the operation of these boards to giddy young things who are utterly unfit to handle judiciously the sensitive nerves of commerce. The dictators of such concerns can never understand why Jones and Robinson, who are both such affable gentlemen when conversing *vis-a-vis*, are so abrupt and disagreeable over the telephone. They do not realize, of course, that Jones and Robinson have their nerves all shot to pieces by the p. b. x. operator before they ever get through to said dictator's desks.

The service telephone operator must be swift, accurate, expressionless. In this she may be nine-tenths machine. The p. b. x. operator must have all these attributes, but she must never be mechanical. She must be human, and kind, and sympathetic, and humble. She must be able to turn incoming malice and incivility to outgoing good humor and courtesy. In a word, she must be a paragon of virtues. If you know of such a one, keep your eye on her, for she is a jewel without price.

DEFEAT OF THE ELSON BILL.

ONCE more independent virtue conquers, and the dragon of unpropitious legislation is laid low. The notorious Elson bill of Ohio, whose defeat was considered almost hopeless even by its opponents, because, it was said, all the Bell and part of the independent forces favored it, was decisively defeated in the state senate on April 20 by a vote of 19 to 14, and a motion to reconsider was repulsed by a vote of 25 to 8.

There is little question that the independents can be acquitted of all charges of unfair lobbying in accomplishing the downfall of this measure. We must conclude, then, that the statement that many independents favored the bill was wrong; else we are forced to believe that the public of Ohio has declared for telephone competition over the heads of those who furnish service. The first theory is the more reasonable, and the pleasanter; unless both causes had a hand in the effect.

At any rate, the Ohio Independent Telephone Association and the National Independent Telephone Association are to be congratulated on their somewhat remarkable achievement. We say remarkable because however exaggerated the report of independent support, the Elson bill had powerful friends—unscrupulous friends, if the lobby investigation at Columbus means anything. Its defeat was based purely upon its undesirability. We can only trust that all undesirable measures—and there will be more of them—will meet the same fate.

WILL THEY NEVER LEARN?

AGAIN we find an independent telephone company through its president and manager reporting to the stockholders that the company during the past year has earned a 20 per cent dividend on a rate of $12 and $24 per annum.

Any telephone man knows that report is absurd without an investigation. To be sure, the dividend was not paid in cash. The money went into construction and gave that much added value to the stock according to the manager's report.

This manager is not the only one in his class. He is not intentionally deceiving his stockholders and the public. He is himself deceived by his inadequate and erroneous system of bookkeeping and honestly passes the error on to others. In the first place, all repair and maintenance on this particular system is credited to "plant account." No account is taken of depreciation. By this means a system of 800 telephones in a county seat town on a rate of $12 and $24 per year is made to show an earning of 20 per cent.

Will some independent telephone men ever learn to stop deceiving themselves as to the true financial condition of their property? Without a system of bookkeeping that correctly assigns to proper account every item of income and expense, while at the same time a sufficient amount is annually set aside to cover depreciation, all statements of earnings and expenses are mere guesswork, highly colored with the desire of the manager to indicate a prosperous condition of the property.

Coming from the president of the Indiana Independent Telephone Association, instead of the *Central Union News*, or some one of the other Bell organs, the foregoing is all the more remarkable. It isn't a great strain on one's memory to recall a time when such information was sadly lacking in independent telephone literature. But it is nevertheless true, and, what is better, independent telephone men have known that the $2-1 rate, while a good enough price to start, outlived its usefulness all too soon. The rate was established as being the most convenient figure for mental bookkeeping. In the little systems—and they all had small beginnings—it was easy to figure eighteen business telephones at $2 and fifty-three residence telephones at $1. When the collector went his rounds he turned in the cash and a memorandum of those who didn't pay. It was the simplest kind of a proceeding. But the systems grew. We have never heard of a single exception to the rule. Every telephone exchange in this country has had unprecedented growth. The old $2-1 rate was inadequate. It was a real menace. It contemplated nothing. We regret that Mr. Norton has not named his exchange. TELEPHONE ENGINEER'S pages are wide open to any manager of an eight hundred station exchange who will tell our readers how he can pay his stockholders 20 per cent on a $2-1 rate.

TELEPHONES IN MINES

WHEN one stops to consider that telephones suitable for use in mines have been manufactured for a number of years, it is astonishing to find how few mines, comparatively, are equipped with them. In at least one state, Illinois, it has been necessary to pass a new law enforcing the installation of telephones in all mines. It is presumable that without such a law a considerable number of mine operators might continue to resist the encroachments of progress and keep their mines in practically the condition which obtained in the quarternary period.

Truly, human life is the cheapest of all dear commodities. In dozens of instances the installation of a mine telephone system would have saved lives that have been snuffed out—yet no such system was installed. Here above ground we think a mere convenience, the saving of a few moments or a few steps, is ample reason for the installation of an intercommunicating telephone system in our office, our factory or our home. Down among the mines we must make special laws that lives be not forfeited to the hatred of progress and to the gambler's chance that stakes a few dollars against ever-threatening calamity.

It is hard to believe that the mine operator is different as a type from other business men. It is easier to suppose that through the peculiar nature of his industry he has not yet become familiar with the modern usages of the telephone. It has not become a part of his daily life as it has with most of us. Telephonically his education is not yet completed; if it were, he would not need the club of legislation over his head to stir him into an obviously advantageous action.

To the lay reader of the daily press, it appears that mine accidents multiply and grow more serious instead of abating as the world advances. When, through the instrumentality of the telephone, these holocausts become controllable, that ubiquitous instrument will deserve another medal to add to its collection.

EDUCATION IN WOOD PRESERVATION

ON another page of this number of Telephone Engineer, Mr. Harry H. Gerhard deplores the fact that at present none of the universities cover in any part of their curricula the vital subject of wood preservation. And this in spite of the fact that the governments of practically every civilized country have devoted a great deal of attention to it, and some of the greatest industries in the world find it of importance equal to other branches of engineering.

Wood preservation is a science itself. It is peculiarly technical in its requirements; chemistry, physics, botany and biology are all involved in its study. Surely there is material here for a special subject in any engineering course—and one in which technical graduates are already being called upon for information which they do not possess. Not that university training is positively essential to the wood-preserving engineer, of course; for that matter, it is not positively essential in any branch of technical works. Some of our most successful civil, mechanical and electrical engineers have not been college men. But we must grant that technical training aids tremendously in systematizing the mental processes of engineering work and in marshaling contemporary knowledge into organization and order—in spite of Mr. R. T. Crane's dissertation to the contrary.

Education, however, is enough of a commercial proposition nowadays to conform largely to the laws of supply and demand. The demand for technical training in wood preservation is beginning to be indicated strongly, so we may expect the supply to appear soon, at least among a few of our more enterprising schools.

* * *

Since the above was put in type, word comes from the United States Forest Service of the completion of the Forest Products Laboratory at Madison, Wis. June 4 has been set as the date for the formal opening. The laboratory has been established to aid, through experiments and demonstrations, the lessening of waste in the manufacture and use of wood. It is a co-operative undertaking between the United States Department of Agriculture and the University of Wisconsin. The state has erected for the purpose a new building at the university and will furnish also the light, heat and power. The Department of Agriculture has supplied the equipment and apparatus and will maintain the force of thirty-five or forty persons required to carry on the work. Through this arrangement, the United States has secured perhaps the largest and best equipped wood testing laboratory in the world.

A number of vacancies in engineering positions in connection with the work will be filled in May and June. Among these are positions of engineer in wood preservation; engineer in timber testing, and chemical engineering. These positions will be given to men with a basis of thorough engineering training, or two or three years' experience in practical work.

The laboratory will be prepared to make tests on the strength and other properties of wood; to investigate the processes of treating timber to prevent destruction by decay and other causes, to study the saving of wood refuse by distillation processes, to examine the fiber of various woods for paper and other purposes, and to determine the influence of the microscopic structure of wood on its characteristics and properties. Facilities are at hand, in fact, for almost any kind of test on wood that practical conditions may require.

TALKING NICE OVER THE TELEPHONE

MR. DENNIS O'BRIEN of St. Louis has had an unfortunate misunderstanding with his wife. It seems that after a long period of happiness, congeniality and mutual understanding, Mrs. O'Brien suddenly became inexplicable to her worthy spouse. In his own words, as given before a magistrate, she "put on airs—and used big words—and (crowning incomprehensibility) she tried to talk nice over the telephone."

We think we can sympathize with Mr. O'Brien. He had used the telephone himself. He knew that a great many men of affairs, of importance, did not try to talk nice over the telephone. He knew that it was the customary thing for ladies like the estimable Mrs. O'Brien to express freely over the telephone their opinions of people who butted in on their party-line connection. In fact, it is entirely probable that this strange happening in his own house was Mr. O'Brien's first apprisal of the fact that any one would try to talk nice over the telephone. For, mind you, he says "try"; he does not admit that she achieved her apparent purpose.

Doubtless there are many others upon whom talking nice over the telephone would impinge with all the force of a novel innovation. We boast, in our shop-talk, of the universality, of the necessity of the telephone. But, obviously, we have not yet got very far in the niceties of its use. The thing is still unfamiliar to some of us. Either we seize the receiver with nervous tenseness while a cold perspiration bursts forth upon us, or we assume a blasé and artificial boldness well calculated to arouse the indignation of our auditor.

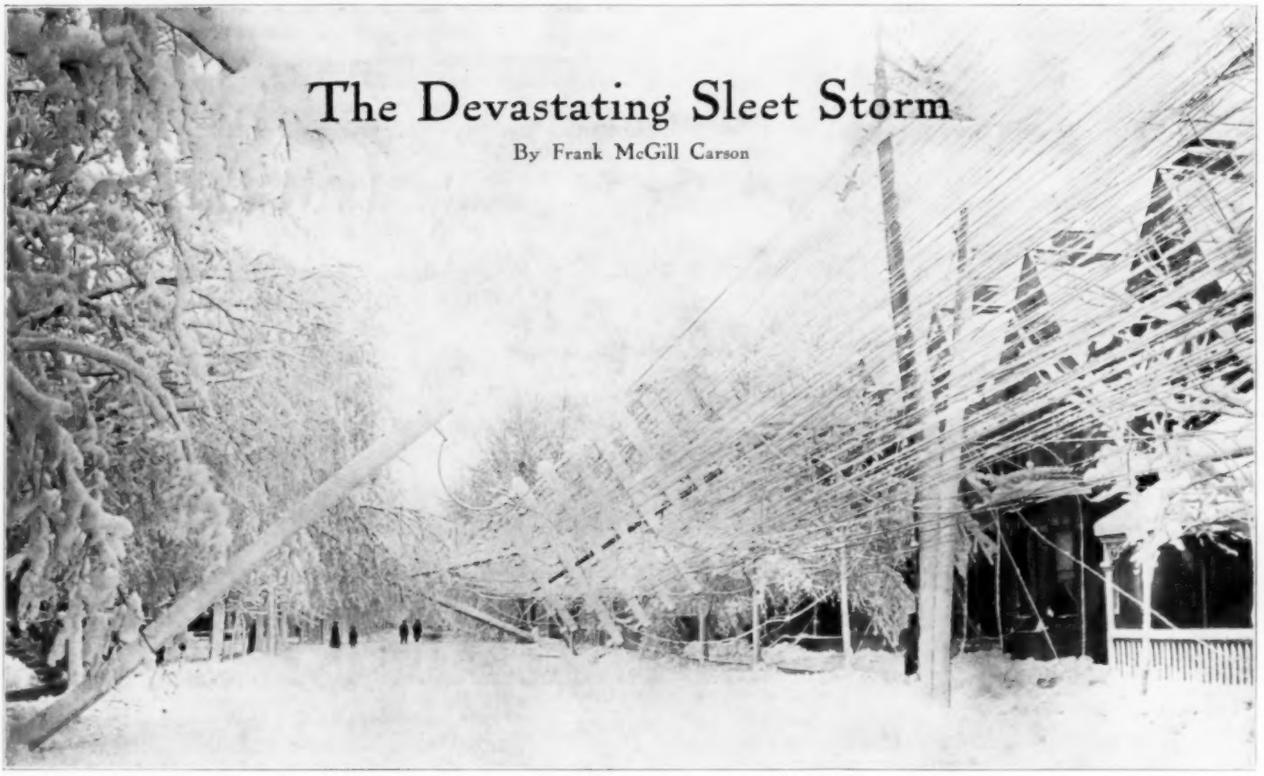
There is a hopeful sign in Mr. O'Brien's trouble. Evidently some one is actually trying, however unsuccessfully, to talk nice over the telephone. Further, Mr. O'Brien's astonishment indicates that there is still much to be done in the way of telephone service development. When everybody has a telephone, and uses it, there is some ground for believing that talking nice over it will become the rule rather than the exception.

SEARCHLIGHT AS LINEMAN'S AID

A SEARCHLIGHT at Tacoma, Wash., was recently utilized by linemen in repairing a break in telephone lines five miles distant. As a result of a sleetstorm many lines were down. Linemen worked all day and when night approached it found them repairing a break on the main line on the side of a hill facing Tacoma, but about five miles from the city. No lights were available, but the manager of the searchlight was prevailed upon to turn it on, and by its assistance the linemen were enabled to complete their work.

The Devastating Sleet Storm

By Frank McGill Carson



Railroads Have Their Washouts, Mines Their Fires.

IMAGINE a busy, efficient telephone service, seemingly as substantial as the proverbial rock, becoming, in the course of a few hours, utterly demoralized and almost helpless; its subscribers unable to communicate with each other, or even with the exchange; its lines lying prostrate upon the frozen ground, tangled and twisted into inextricable confusion between shattered and broken poles. That is but the ordinary description of the effect of a sleet storm upon open pole lines.

Such a visitation of Providence is not necessarily a reflection upon the stability of the telephone business, for railroads have their washouts, and mines their fires. Indeed, it is evidence of the remarkable resources and resiliency of the industry that in most cases the stricken system is restored to service in what must seem to the lay observer a miraculously short time. But restoration of a sleet-devastated system is expensive in labor and materials. It often means practically the rebuilding of many lines, while even a brief interruption of telephone service in these days is a serious matter.

It is an interesting example of the perversity of nature that the most violent and destructive sleet storms seem most frequently to occur on Saturday nights or Sundays, when the greater part of the outside construction force is at home and it is impossible to get them by wire because there are no wires. Fortunately, the storm itself is generally enough of an indication to the willing employees that their services are needed. Such a Sunday storm in the middle west in January, 1908, put 4,232 subscribers' stations out of commission, while 222 poles went down on toll and trunk leads. These figures do not take into account the large number of poles which were thrown out of the perpendicular, cross-arms and anchors which were broken, and foreign lines which became crossed with the telephone leads. The total cost of repairs to this system after this one storm was $60,000.

In February, 1909, a terrific sleet storm passed over Ohio, Indiana, Illinois and Iowa, devastating a belt some sixty miles wide. This, too, was a Sunday storm; or, at least, the first reports came in Sunday noon, although it was the Friday following before general directions for rebuilding the stricken lines could be issued. The aggregate loss to operating companies in this afflicted territory amounted to hundreds of thousands of dollars. In proof of the fact that heavily loaded poles are little more liable to damage than small leads, the Central Union line between Winamac and Kewanna, Ind., carrying one circuit, lost twenty-five poles; while in Monroeville, Ind., a half-mile cable lead went down. New construction naturally showed less damage than old, although a line from Logansport to Kokomo, Ind., which had been practically rebuilt but a few months before, suffered severely. Some of the A. T. and T. lines, with poles very closely spaced, went down as promptly as did those lines of longer span.

At about this same period the central part of New York State was visited by a severe sleet storm, which swept down the valley of the Mohawk. In Frankfort the sleet-coated wires sagged down eight or ten feet on hundred-foot spans. Few poles were broken there, but many lines were short-circuited. Between Ilion and Herkimer, cross-arms were broken, pole tops snapped off and the wires stripped completely between poles that were left standing. Nearly all the wires of both telephone companies and the electric light company were put out of service. There were many instances of the

tenacity with which sleet hangs to the wires; the best of these was probably shown by the mass of wires hanging loose from the cross-arms of the poles. These had probably fallen thirty-five or forty feet, and yet the sleet had not been broken on the wires. The Independent Telephone Company's wires were almost totally destroyed. Its poles, being still rather new, were left stand-

Lines Lying Prostrate Upon the Frozen Ground.

ing, but the wires were stripped from them. The Bell company suffered more, as its poles were older and more heavily laden.

One pole line, carrying four ten-pin cross-arms and one 150-pair telephone cable, was down for a distance of 1,200 feet, and the cable, in falling on the wires of the trolley company, was so badly burned as to be unfit for use. The poles were broken in various places, some close to the ground and some near the tops of the poles. In one instance a telephone pole about fifty feet long was found to be broken in three parts. The trolley lines of the Utica and Mohawk Valley Railway Company at this point were also put out of service, due probably to the falling of the telephone lines, rather than to the effect of the sleet on the trolley wires.

Two pieces of ice, one taken from an $\frac{11}{16}$-inch cable and one from a No. 10 telephone wire, were weighed. Both wires seemed to be coated with a thickness of ice about the same, and the coating was on the under side. The piece of ice from the No. 10 telephone wire weighed three-quarters of a pound and was ten inches long, making a uniform weight of 0.9 pound per lineal foot. The piece from the cable weighed one and one-half pounds and was fourteen inches long, making a weight of 1.28 pounds to the foot. These were not exceptional specimens, but were a fair average of the general conditions.

The Wisconsin Railroad Commission's last report gives some interesting sleet storm data, gathered during an investigation conducted during 1909. On January 27, 28 and 29 of that year a very severe sleet and snow storm occurred in the state of Wisconsin, causing heavy losses to many telephone companies. The snow storm was so severe in the immediate vicinity of Madison that the commission at once began gathering all available data concerning the character and amount of damage sustained by the various telephone companies in the state. Over five hundred blank forms were sent out, one to each telephone company, a short time after the storm had occurred. These blanks requested information as to the number of interruptions to service caused by the storm and the duration of such interruptions for both city and rural subscribers. The extent of damage was also requested, covering the number of poles broken, length of lines "down" and cost of repairs, including material and labor. An estimate was also asked concerning the probable revenue losses on toll or long-distance business, as well as allowance or refund made to regular subscribers on account of interruptions. Approximately 335 companies answered this inquiry within a few weeks after same was sent out. These 335 companies consisted entirely of independent exchanges. The Wisconsin Telephone Company, comprising the Bell exchanges in the state, handed in an approximate report covering their various properties. As soon as all repairs were made they submitted a very detailed report on the storm damage. Of the 335 reports submitted, over 44 showed damages exceeding $50. The total damage reported by the independent exchanges was in the neighborhood of $12,000, while the Wisconsin Telephone Company reported $50,000 damages to its local and toll lines. The storm interrupted the service in many cases for more than a week, and in some cases the lines were almost totally wrecked. As the reports were received from the various companies, the amount of damage was plotted upon a map of the state at the location of the exchange reporting. This map showed that the severity of the storm was confined almost entirely to the southern quarter of the state. The northern limits were Gilmanton (which is a short distance north of La Crosse), Portage, Watertown and Mequon (which is a short distance north of Milwaukee), and the storm area extended southward into Illinois and westward into Iowa and Minnesota.

In the initial stages of the storm a heavy mist prevailed over the southern part of Wisconsin. The wind was from the southeast, but shifted to the northeast during the night of January 28, and the mist began to form sleet. An extremely heavy coating collected on almost all telephone lines in the above mentioned region, in some cases attaining a thickness of two and one-half inches. This caused an additional weight upon the telephone wires of as much as two pounds per foot in certain sections. The heaviest sleet section extended from Watertown to Madison. Immediately after the formation of this sleet a violent wind storm arose which wrecked a great majority of the lines that had withstood

The Devastating Sleet Storm.

the weight of the ice-covered wires. Practically all lines running north and south in this heavy sleet section were badly damaged, as they received the full effect of the wind. Lines running east and west in most cases escaped with but slight damage. The exchanges most severely affected were: Madison, $5,000; Lake Mills, $1,015; Mt. Vernon, $1,000; Janesville, $775; Stoughton, $760;

Waterloo, $758; Watertown, $750; Prairie du Sac, $706; Jefferson, $690; Gilmanton, $678; Hillsboro, $530. These figures are approximate.

The toll lines most seriously affected were: Watertown to Jefferson, $4,857; Watertown to Beaver Dam, $922; Madison to Milwaukee, $2,840; Madison to Janesville, $1,702; Madison to Stevens Point, $792; Madison to La Crosse, $677; Madison to Tomah, $627; Richmond to Eagle, $2,315.

The total damage caused by this storm to telephone companies in the state would range approximately from $60,000 to $75,000. In some instances the telephone lines were completely wrecked and had to be rebuilt entirely.

The object of the investigation of the damage caused by the sleet and snow storm of January 27-29, 1909, was to obtain some data as to the element of damage due to these storms, it being recognized that they are one of the hazards of the telephone business involving the question of depreciation and replacements. To obtain additional data along this and related lines, an investigation was made of the records at the Madison weather bureau. It was found that there have been twenty-six storms since 1880 during the months of January, February, March, November and December in which the precipitation was greater than one inch during twenty-four hours. An inch precipitation in the form of snow is approximately equal to a depth of ten inches.

From the available data it seems that during the period since 1880 there have been at least five or six storms where sleet formed rapidly enough to cause great damage. During the earlier years of this period, however, there were comparatively few telephone lines to be affected.

The annual snowfall in the three natural divisions of the state is: Northern, 53 inches; Central, 36 inches; Southern, 40 inches. The snowfall in the central portion of the state is lighter because this region is removed somewhat from the path of the Lake Superior storms which affect the northern part of the state, and is also out of the line of the storms which come up the Mississippi valley and move toward the lakes.

The Sleet Had Not Been Broken by the Fall.

As the average temperature of the southern part of the state is somewhat higher than farther north, it seems that sleet is more readily formed here, and for this reason the storms in this part of the state cause more damage than the northern storms. Sleet storms in the most northerly limits of the state have usually occurred chiefly along the immediate shore line of Lake Superior during the spring months, when the temperature and other conditions approximate those which accompany the severe mid-winter sleet storms of southern Wisconsin. The government weather report state that, on an average, three tornadoes occur annually in Wisconsin.

The great damage caused by the January storm was

due to the fact that immediately after the formation of the sleet a very high wind arose, which blew down the telephone lines, which had become greatly weakened by the enormous sleet load upon them.

The Wisconsin Telephone Company submitted the following statement concerning the amount of damage to its own properties caused by storms:

"It is not unusual for sleet and wet snow to damage telephone wires within limited areas in eastern and southern Wisconsin, but the storm of January, 1909, was more general and caused greater damage than any storm since the Wisconsin Telephone Company has been in operation. The notable sleet storms of record occurred in the following named years:

March, 1901—Along the eastern part of state from Green Bay on the north to the south state line. Expense of making repairs	$12,368
December, 1902—In the vicinity of Madison and in and around Lake Geneva. Expense of making repairs	4,778
December, 1904; January, 1905; February, 1905; March, 1905—Central in and around Oshkosh, Appleton and Green Bay, with some damage at Ripon, Fond du Lac, and extending southwest to Madison. Expense of making temporary repairs not separated for the different storm dates, but totaled	29,710
December, 1908—A severe sleet storm occurred on the lake shore in a limited area, embracing Port Washington, Sheboygan and Manitowoc, causing damage to telephone property of the several companies operating in that section of approximately	20,000
March 8, 1908—A sleet storm of considerable severity occurred, embracing quite a wide area from Milwaukee to Lone Rock east and west, and from Portage to Lake Geneva north and south. The approximate cost of restoring the plant to serviceable condition was	5,000
To the foregoing should be added:	
January 27-29, 1909—The most severe sleet storm in years occurred Jan. 27-29, and extended over an area from La Crosse to Milwaukee, embracing practically all of the south quarter of the state. The center of greatest damage was approximately in Dane and Jefferson counties. The total losses sustained by telephone companies was in excess of	60,000

Everybody remembers the big storm which struck Washington, D. C., during the last presidential inauguration. Before midnight of the night before inauguration day Paul G. Burton, division superintendent of the Chesapeake and Potomac Telephone Company, looked out of his window and noticed how big the snowflakes were. Being wise in the business, he knew at once that there was trouble ahead for the company, for big flakes meant wet, heavy snow, and wet, heavy snow means broken wires, general disaster and innumerable complaints from subscribers, who can't understand why somebody doesn't go out there and twist the wires together and establish the connection right away.

When all this flashed through his mind, Mr. Burton got into action. He went to the main testroom and told all the test men to keep testing the connections, particularly those to the suburban and long-distance points. Ordinarily these tests are made regularly every morning. But the conditions that prevailed on the night of March 3 were far from ordinary, and the telephone official had no intention of being caught napping.

About half-past one on the morning of the 4th the first break occurred, and then the wires began going fast. At four o'clock in the morning wires in various sections of Washington were out of commission and the only long-distance connections from the Washington exchange to outside points were with Frederick, Hagerstown and Cumberland.

Mr. Burton realized that as the wires to these points had stood the test that far they were likely to stay working, so he knew pretty well how he stood.

Long before this, however, he had sent out emergency calls to his linemen all over Washington, and they responded promptly. At four o'clock in the morning he sent a special delivery letter to the superintendent of long-distance wires at Philadelphia, containing a full report. The long-distance superintendent reached out with his test wires toward Washington and found that there was a good connection between Pittsburg and a point near Cumberland, and decided to work at that point for the restoration of long-distance connection between Washington and the north.

The long-distance superintendent, who did not receive Mr. Burton's letter until 4 p. m. March 4, located a gang of linemen at Bedford, Pa., about twenty-five miles from Cumberland, and threw them in above Cumberland to find the trouble. They went to work at once.

Inextricable Confusion Between Broken Poles.

That they moved rapidly is shown by the fact that at 6:30 p. m., just two hours and a half after Mr. Burton's letter had been received in Philadelphia, the connection between Washington and Pittsburg was reestablished.

In the meantime the division superintendent at Baltimore had sent a gang out toward Frederick on suspicion, and a gang had also left Frederick for Baltimore.

These gangs started toward each other at 4 a. m. March 4 and at 3 p. m. the following day they had established a connection. This gave Washington two lines out of the city toward the north. The connection with Pittsburg joined the north and south through Washington, and the men on these jobs were all called in to work in Baltimore and Washington and the immediate vicinity of these two cities.

Hurry-up calls had been sent out for extra gangs of linemen. In answer to the call they came from Hunt-

ington and Charleston, W. Va.; from Philadelphia, Wilkesbarre and Hazleton, Pa., and from Norfolk and Richmond, Va., and from Spartanburg, S. C.

Then the work of straightening things out in Washington began in earnest. Every wire was tested and the city was divided up into territories for the sake of expediting the work.

The subscribers' cards are ordinarily filed away according to the number of their telephones, regardless of their location. These cards were all taken out and rearranged according to district and given the repair gangs.

The only special cases attended to were those of doctors and hospitals. Other subscribers were attended to according to districts, this method being much quicker and effective. Consideration was given, however, to those districts which were totally out of commission. The officials figured that if in one square half the telephones were out of commission, those subscribers who were cut off could use the working telephones of their neighbors. Therefore they gave first aid to those sections which were totally cut off.

In getting its men out, the company was aided materially by the police. Those of the men who could not be reached by telephone were waked up by the police at the request of the telephone company, which worked through the captains of the various precincts.

The Washington warehouse of the telephone company had enough repair material on hand to keep going until additional supplies could be received. Miles of wire and cable were sent in from Philadelphia, New York, Trenton, Boston and Scranton. Orders were immediately placed by the Washington office for extra poles and other necessary equipment from Virginia and Maryland.

Every pole was numbered and as soon as the scouts who were out making an examination of the damaged lines reported such and such a pole broken, the officials knew the size of the pole and who to order a new one from. These scouts rode through the country on horseback or went on foot and sent in their reports the best way they could.

Immediately behind the scouts went the linemen closing up the broken wires with twisted insulated wires, which they hung across the tops of poles that were standing or swung over tree branches. In some instances the cable was lying flat on the ground, but still working.

A somewhat disheartening feature of sleet storm effect is a common attitude of the public toward the afflicted company. Sympathy is rather unusual, the popular idea seeming to be that a public service corporation is well able to take care of its extraordinary expenses, and that any destruction of its property is an indication of carelessness. Sometimes, though, the company is agreeably surprised by an entirely different expression of sentiment, and by a gratifying exhibition of patience on the part of the subscriber.

Of course, the only real cure for sleet storm troubles is underground construction; and in many cases that is impracticable at the present time. Like flood, fire and other visitations, the only recourse is to guard against them as far as possible, trusting to good material and careful construction to minimize the damage, and, most important of all, to see to it that rates are high enough in the first place to allow ample funds for rebuilding and repairing when the trouble does come.

How to Read Telephone Circuit Diagrams

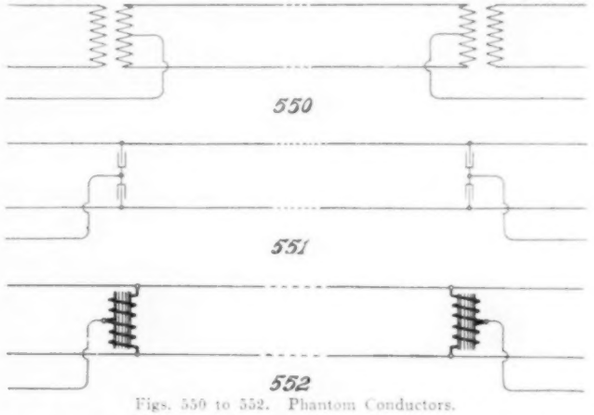
By David S. Hulfish

Copyright 1910 by the Electricity Magazine Corporation.

LESSON XVI.

"THE phantom circuit" is the name given to a derived circuit upon a telephone line, the system of connection of the principal and derived circuits and of the instruments working upon them being such that the instruments of the principal circuit are unresponsive to currents flowing over the derived circuit, and the instruments of the derived circuit are unresponsive to currents flowing over the principal circuit. The two circuits are operatively independent.

The phantom in one of its forms may be understood from Fig. 552 and the circuit of the Wheatstone bridge. The Wheatstone bridge formed the subject of Fig. 445.* When a Wheatstone bridge is adjusted to a balance, the galvanometer is unresponsive to currents through the battery circuit; a dozen galvanometers might be connected between the two ends of the bridge, and the wires between the two ends might be indefinitely lengthened, yet this would be true. In Fig. 552, such a distorted or modified Wheatstone bridge arrangement is shown. The ratio arms are at the left, the battery circuit entering at the middle; the resistance arms are at the right, with the battery circuit leaving at the middle. Telephones connected between the pair of line wires of this form of Wheatstone bridge arrangement would correspond to galvanometers across a balanced Wheatstone bridge and will be unresponsive to any currents passing over the battery circuit. By converting the battery circuit of the bridge arrangement into a telephone line by connecting telephones between its ends and earth,



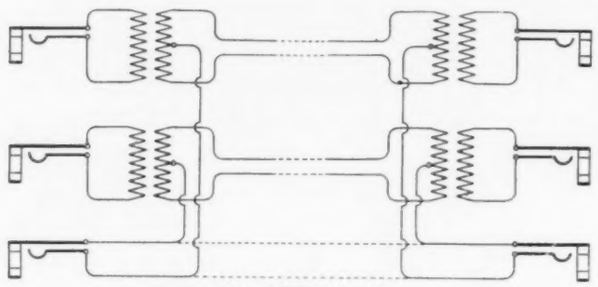
Figs. 550 to 552. Phantom Conductors.

there will be constructed a derived or "phantom" telephone circuit consisting of the two line wires in parallel and an earth return. The telephones upon the main telephone circuit will be unresponsive to the speech or ringing currents of the phantom line.

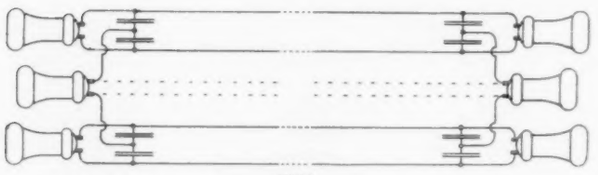
*TELEPHONE ENGINEER, January, 1910.

Also, by a study of simultaneous potentials, it may be shown that the telephones of the phantom circuit are unresponsive to the speech or ringing currents of the principal telephone line upon which the phantom is derived.

For convenient discrimination, the terms "phantom circuit" and "physical circuit" are used, the



553



554

Figs. 553 and 554. Metallic Circuit Phantom Telephone Lines.

physical circuit being that circuit using a pair of wires in series for the transmission of currents, and the phantom circuit being the derived circuit which uses the pair in parallel.

There is no symbol for the phantom, *per se*. It is a circuit, traced through such symbols as may be required to represent the apparatus required to set up the phantom condition in the diagram.

Fig. 550 shows a diagram of a phantom formed with repeating coils. This is the easiest and most convenient form to construct and use in service, and therefore most likely to be met in circuit diagrams.

Fig. 551 shows a diagram of a phantom formed with condensers. The condensers used are of small capacity. The phantom may be used for telephone service only, because only fluctuating currents may be transmitted over it.

Fig. 552 shows a diagram of a phantom formed with retardation coils. For currents which flow from wire to wire of the physical pair, the retardation coils are highly inductive; for the currents of the phantom circuit, which flow between the center and both ends, the retardation coils are neutral or non-inductive, thus presenting only their ohmic resistance.

In each of the three instances, the currents of the phantom circuit divide in the bridging phantoming apparatus and flow equally upon the two wires of the physical circuit.

Figs. 553 to 557, inclusive, show some applications of the phantom circuit to practice in telephony, as likely to be met in telephone circuit diagrams.

Fig. 553 shows two physical circuits connected as two trunks between two switchboards. The derived circuits of the two physical circuits are used to form a metallic circuit phantom, being the equivalent for commercial purposes of the dotted conductors suggested at the bottom of the figure.

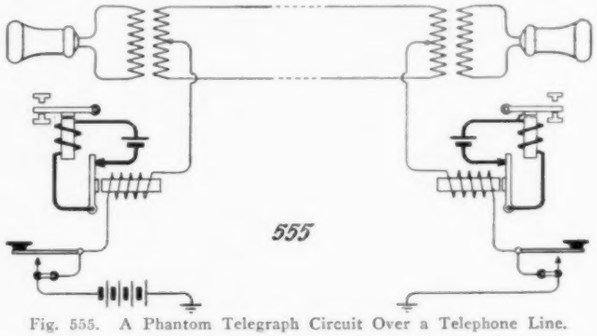
In Fig. 554 a similar combination of two condenser phantoms to form a metallic circuit phantom is shown, the phantom circuit produced being the equivalent of the pair of conductors suggested by the dotted lines across the middle of the figure.

In Fig. 555, telephone and telegraph circuits are shown working simultaneously over a single pair of wires, the telephone circuit being a metallic circuit and the telegraph circuit being a grounded or earth return circuit. The telephone circuit of course may pass to switchboard line or trunk jacks instead of to telephone substation equipments as indicated in the diagram. The telegraph circuits need not be on the same premises with the telephone equipment of the line, being extended further to any distance desired by means of telegraphic line wires.

Physical circuits may be "phantomed" for a portion of their length, and phantom circuits likewise may be phantom for a portion of their length and physical for the remaining portion. In the switchboards, physical and phantom circuits may be connected indiscriminately.

Fig. 556 shows a telephone trunk circuit between two switchboards in which the lamp signals are operated over the phantom of the trunk. At each end there is shown a jack, a repeating coil, a key, a lamp and a battery, the two batteries normally being connected to the phantom in opposition. The depression of the key at either end of the trunk will operate the lamp at the distant end until the distant key is operated also or the home key restored.

In Fig. 557 a circuit is shown in which the phantom of a subscriber's line is used as a circuit for supplying his transmitter at the substation with current from the central office battery. The battery supply circuit is traced from earth through the battery, through the right-hand relay to the middle of the line side of the repeating coil, thence over the "phantom," or both wires of the line in parallel, to the secondary of the induction coil of the substation telephone; thence through the two windings of the receiver to the hook switch and to the upper junction point in the primary circuit of the telephone, through the primary winding of the induction coil and the transmitter to earth. The substation condenser is charged by the potential difference across the primary and transmitter, and its charge varies with the re-



555

Fig. 555. A Phantom Telegraph Circuit Over a Telephone Line.

sistance of the transmitter. Variations in the volume of charge in the condenser are obtained by direct charge over the phantom of the line and by discharge through the primary of the induction coil. These fluctuating currents through the primary cause induced currents in the secondary, which induced currents are transmitted over the two wires of the "phys-

ical" line and through the repeating coil at the central office to the jacks of the central office switchboard, the energy thus transmitted over the physical circuit being non-interfering with the steady feed of current over the phantom.

In the line side of the central office repeating coil, the windings are inductive to the speech currents, but non-inductive to the currents of the phantom; in the secondary of the induction coil at the telephone, the same is true. In the receiver of the substation, which is shown wound with two coils, the same also is true. The ringer bridge is unaffected by the direct currents of the phantom, and does not require a condenser.

The central office signaling and switching circuits of this diagram will offer practice in reading eccentric systems.

When the line relay is energized by current over the phantom as above described, the path being closed when the hook lever rises and closes its contacts, current is permitted through the armature and contact of the line relay at the right, armature and back contact of the cut-off relay at the left and signal lamp to earth, causing the lamp to glow as a signal to the switchboard operator. The potential of the battery passes also through the winding of the cut-off relay and one winding of the repeating coil to the multiple jacks, causing the line to test "busy" as soon as the receiver is lifted at the substation.

When the operator answers with a plug of the pair shown at the top of the figure, path is completed to earth for current through the cut-off relay and the visual signal of the plug, energizing both, interrupting the current of the lamp by opening the contact of the cut-off relay, and continuing the display of the visual of the plug so long as the receiver remains off the hook at the sub-station.

But one wire passes from the line equipment to the switchboard jacks, and but one conductor is attached to the switching plugs, giving a jack and plug of maximum simplicity.

The talking circuit through the switchboard extends from the live side of the main battery through the armature and contact of the line relay, helix and non-inductive shunt of the cut-off relay, central office side of the repeating coil of the calling line, switchboard jack, plug, connecting conductors including condenser and key, remaining plug, jack of the called line, central office side of the repeating coil of the

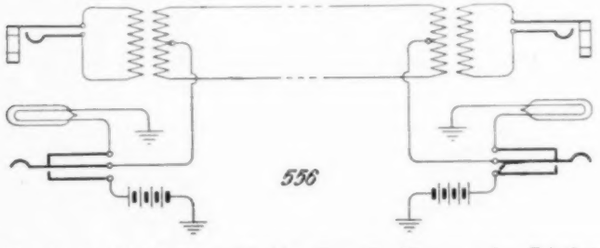


Fig. 556. A Signal Circuit Working Over the Phantom of a Telephone Line.

called line, helix and non-inductive shunt of the cut-off relay of the called line, contact and armature of the line relay of the called line to the live side of the main battery, which is the point at which the tracing of the circuit was begun. Prior to the answering of the called station, the circuit for ringing current extends from the cut-off relay helix to earth through the line lamp, the ringing current being repeated into the called line by the action of the repeating coil.

The key of the plug pair also exhibits a peculiarity. When the moving spring is pressed upward as directions are shown in the diagram, it engages the contact *O* leading to the operator's telephone, but without breaking the contact leading to the answer-

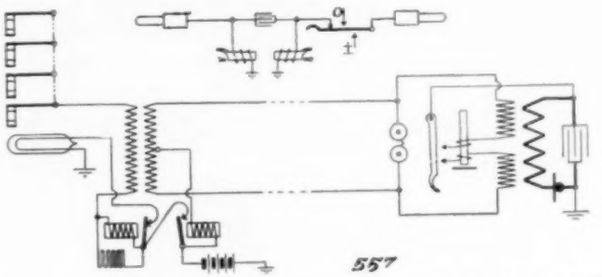


Fig. 557. A Common Battery Transmitter Fed Over the Phantom of the Telephone Line.

ing plug at the left. When the moving spring is pressed downward, it breaks the contact leading to the answering plug and connects the ringing plug at the right to the contact which, according to the symbol adjacent is connected to a source of alternating current, namely, the ringing generator.

When reading the circuit of Fig. 558, which shows a system of composite telegraphy and telephony, it is necessary to keep in mind the electrical constants of the various parts of apparatus. There is no new symbol for any part of the apparatus involved in this circuit diagram, but there is involved a principle which is met in nearly all telephone circuits. This is the division of currents unequally among derived paths.

By derived paths is meant the paths of a pair or more of paths, each of which will take a portion of current which at some point flows over a common path. Where constant potentials only are to be considered as sources of current, the derived paths will take currents inversely proportional to their resistances, the flow through each item of resistance being governed by Ohm's law.

Where currents of varying frequency are involved, particularly where telephone speech currents are involved, the currents in the derived paths do not flow according to Ohm's law. Where telephone speech currents and constant potential currents, as from a battery, flow at the same time over the same wire and then encounter a set of branching circuits, it is not at all an obvious conclusion that they will divide into the derived circuits in the same proportions for each of the possible paths.

Such a division may not be taken for granted until after each of the possible paths has been examined for evidence of its electrical constants, such as resistance, inductance, potential and capacity. It may be that, of a pair of branches leading from a main line wire, one of the branches will take the lion's share of the speech currents of the line and the other branch will take the lion's share of the battery currents of the line, although the one-line conductor has been carrying both kinds of current harmoniously up to the point of branching.

Inductance connected in series in a conductor opposes the passage of telephone voice currents with

far greater effectiveness than it opposes the passage of currents from a source of constant potential, or such currents as the intermittent currents of a telegraph system. On the other hand, a condenser connected in series in a conductor will oppose the battery currents of telegraphy most effectively, and will oppose the telephone speech currents with but little effect.

By taking advantage of these characteristics it is possible to construct a pair of derived paths, in series with a line circuit, or among line conductors, such that one of the paths will carry substantially nothing but telegraph currents and the other path will carry substantially nothing but telephone currents. Such a system renders possible simultaneous telegraphy and telephony over the same line conductors, and it bears the name of composite telegraphy and telephony.

Fig. 558 shows a circuit diagram of a composited line. The line conductors *V* and *W* branch at the points *13* and *17* at the left and *14* and *16* at the right.

The telegraph circuits may be traced easily. Beginning at the upper left-hand corner of the diagram, at earth symbol *Z*, proceeding through battery *h*, key *n*, telegraph relay *r*, conductor *9*, and inductance or highly inductive resistance *f* to the junction point *13*, we may trace to the left from the junction point until the condenser *x* is encountered; as current from the battery *h* cannot flow through the condenser *x* which has been encountered, all current from the battery *h* must flow from the junction point *13* to the right and over the line conductor *V* to the junction point *14*. From the junction point *14* to the right and downward a condenser *x* is encountered, stopping the battery current, so all battery current coming over the line wire *V* must follow the branch path upward and to the right from junction *14*, through inductance *f*, conductor *8*, telegraph relay *r*, key *n* and battery h_2 to earth at symbol *Z*. Note that the two batteries which are included in this circuit, namely, battery *h* and battery h_2, are indicated as having grounded their poles of opposing polarity, so that the potentials of the two

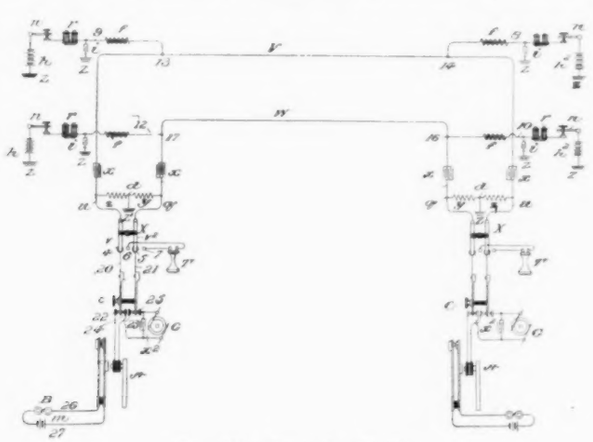


Fig. 558. Composite Circuit.

batteries are added in producing a current in the line conductor. The telegraph current does not flow through the condenser *i* from conductor *8* to earth, nor from conductor *9* to earth.

In like manner, the telegraph circuit over line conductor *W* may be traced from earth at the left over the elements *h, n, r, f, 12, 17, W, 16, f, 10, r, n,* h_2 to earth. In this circuit also the branches to the condensers *x, x, i* and *i* are encountered, but none of these branches can carry current from the batteries *h* to h_2.

The two telegraph circuits traced are independent of each other, and may operate simultaneously and without interference.

Tracing now the path for speech currents, these

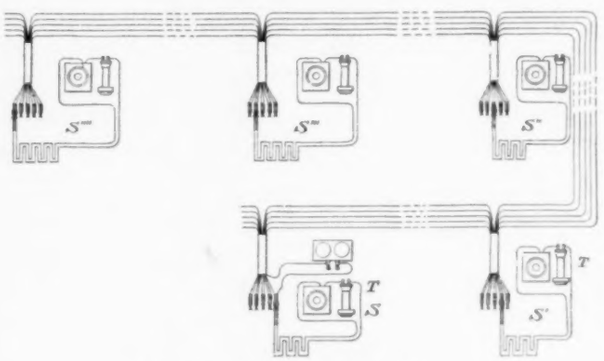


Fig. 559. Intercommunicating Circuit.

must originate in one telephone *T* and terminate in the other telephone *T*, each of the symbols *T* and *T* being taken to represent a complete talking equipment. With the switches *X* and *X* at left and right, both considered as with their levers shifted to the right, the two telephones *T* and *T* are connected to the line conductors *W* and *V*.

Starting from the telephone *T* at the left, trace both conductors of the line at the same time. Passing through both levers of the switch or key *X*, and over conductors *u* and *q*, junction points are encountered which offer paths through resistances *z* and *y* to earth. While the symbols of these resistances do not specifically indicate that they are of high inductance, it seems necessary to assume that they are such, and that there is no appreciable leakage of the telephone voice currents through them, either from wire to wire of the line or to earth.

Next, the two condensers *x* and *x* are encountered, but these offer no opposition to the passage of the speech currents. When the junction points *13* and *17* are reached in the two-line wires, two more branch paths to earth are encountered, but the formidable inductances *f* and *f* tell the defeat of any currents attempting to flow over those branches.

Substantially the total quantity of speech current output of the telephone *T* at the left therefore reaches the line conductors *V* and *W* and passes over those line conductors to the apparatus indicated at the right of the circuit diagram. Here, again, are encountered, first, the earth branches containing the blockading inductances *f* and *f*, then the friendly condensers *x* and *x*, then the ineffective resistances *y* and *z*, then the switch *X* and the telephone *T*.

The telephone current has been unable to flow through the telegraph instruments, either effectively or wastefully; nor have the telegraph currents been able to flow through the telephone circuits. The two telegraph circuits and the one telephone circuit are operating harmoniously and without interference, simultaneously, upon the single pair of line wires *V* and *W*.

The efficiency of the condensers and inductances in shutting out the telegraph and telephone currents, respectively, is not so great but that some little leakage occurs. For this reason the small condensers *i i i i* permit to waste to earth such telephone currents as leak through the inductances *f f f f*, and the inductances *z y*

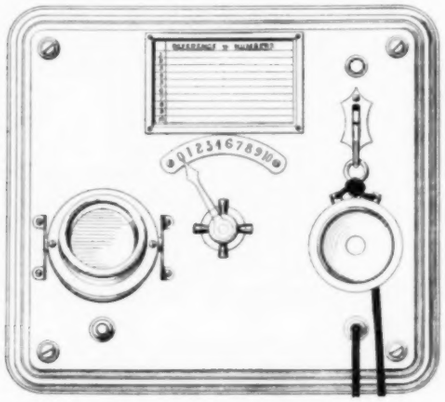


Fig. 560. Intercommunicating Switch Box, Exterior.

y z permit to waste to earth such telegraph energy as may leak through the condensers *x x x x*.

In this circuit, ringing upon the telephone pair with a ringing generator of slow pulsations might send such heavy currents over the line conductors as would rattle the telegraph relays in an objectionable manner. To obviate this the ringing generators *G* and *G* at left and right, for signaling over the telephone circuit of the composite line, are made of very high frequency. By the operation of either key *c* at right or left of the diagram, the current from the high-frequency generator is passed over the line conductors, and because of its high frequency it passes through the condensers and is obstructed by the inductances, as the circuit was traced for the telephone speech currents. At this time, however, when the ringing signals are being sent over the telephone line, the keys *X* and *X* are in their left-hand positions, as shown in the diagram, and the ringing current received at either end will pass down through the closed key *c* and through the helix of the relay *A*. The relay *A* formed the subject of Figs. 333 and 334*, the former being a detail view and the latter a symbol. It is a relay especially designed for response to currents of high frequency, and by its action the ringing signal is announced upon the signal device *B*.

Private telephone systems may have a switchboard and be operated much as a public exchange is operated. In such instances the circuits usually are much the same.

In a small private system the switchboard may be dispensed with by some arrangement which enables each station of the system to call any other station without the assistance of a central office or switching station. This method of operating requires at each station an intercommunicating switch which will enable the subscriber there to place his telephone in connection with the line to any other station.

A simple system of this type is shown in the diagram of Fig. 559. Five lines are shown. Assuming that the system is a metallic-circuit system, each line of the diagram represents a pair of line conductors. Five stations also are shown; one telephone line for each station. At each station five switching jacks are shown—one for each of the lines. At each station a telephone set is shown, attached to a switching plug tor the jacks. That portion of the telephone conductors adjacent to the plug in each station, resembling to some extent the symbol of Fig. 479, is in this instance but an indication that the switching plug is united to the telephone set by a flexible cord. In connection with the station *S* a call bell is shown; it is obvious, however, that each station must have some sort of calling device, either attached permanently to its own line, as the call bell of station *S* seems to be, or forming a part of the telephone set indicated as a whole by the transmitter and receiver shown at *T* for each station.

Station *S* normally, when idle, is connected by its plug and jack to that line belonging to the right-hand jack, or first jack of all of the sets of jacks. Station *S'* normally is upon the line connected with the second jack of all the sets, and similarly for stations S_2, S_3 and S_4. Each has its own line, and normally is connected through its own plug to its own line.

In operation, if any station desires to call any other, the telephone user removes his home plug from the jack of his home line and places it in the jack belonging to the line of the station which he desires to call. This connects both of the telephones to the one line, and assuming now that each of the telephones is equipped with call bell and generator, the first party may ring up the second and hold conversation.

Intercommunicating systems will be found to embody this principle in different forms of apparatus. Provisions for busy test of the desired line, and provisions for "locking out" or preventing access of a third station to a line in use by two stations in conversation may be encountered, also many specific types of switches.

As an illustration of a specific type of intercommunicating switch, a face view of the outside of the switch is shown in Fig. 560, and a view of the interior

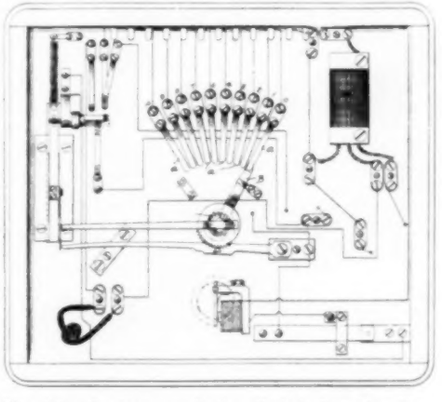


Fig. 561. Intercommunicating Switch Box, Interior.

is shown in Fig. 561. Attention is directed to the pivoted switch arm *B*, near the middle of Fig. 561, and the arc of fixed contact springs *a, a, a, a, a*, with any one of which the movable switch arm may make electrical contact.

(To be continued.)

* TELEPHONE ENGINEER, December, 1909.

The New York Commission Bill

The bill recommended by the New York special legislative committee to put telephone and telegraph companies under state supervision was introduced April 11 at Albany by Senator Davis and Assemblyman Merritt. It follows closely the report of the committee. It provides that all telephone and telegraph companies doing business entirely or partly within the state shall be under the jurisdiction of the Public Service Commission of the second district. The jurisdiction of the commission, however, is not to extend to mutual co-operative telephone companies, which are those conducted by farmers for their own convenience, and not for profit.

The commission is to have power on complaints or on its own motion, after a hearing, to issue orders substituting for what it deems unreasonable or unjust rates or inadequate service what it deems just or reasonable rates and adequate service. The commission, however, is not to have power to make an order requiring a telephone or telegraph company to perform any act not required by its franchise or by any law of the state or of the United States. This provision is believed to give the corporations the right of review in the courts of the commission's orders.

The commission will have investigating powers and some control over the forms of accounts and records of the companies, which are required to file with the commission annual reports. It is to have a veto power over the exercise by these corporations of rights or privileges under their franchises which they have not exercised up to the time of the passage of the act. The bill contains provisions against discrimination in rates. It prohibits any corporation other than a telephone or telegraph company to acquire more than 10 per cent of the capital stock of any telephone or telegraph company.

It also prohibits the giving of franks or reduction of rates to any except officers, agents, employees of the companies and their families, and, excepting persons engaged exclusively in charitable work, officers and employees of sleeping car, railroad, express and other telephone and telegraph companies and to agents or employes of the United States or the state for the transmission of official messages only. The commission is also given considerable control of the financial affairs of the companies and the issuance of stocks and bonds.

Making Rubber-Covered Wire

Concerning the making of rubber-covered wire, Ira W. Henry says in the *India Rubber World:*

The first American companies followed the process introduced by Messrs. Siemens Brothers, of England and Germany, for applying rubber to an electric conductor. By this process two strips of rubber were placed longitudinally so as to cover the conducting wire. The whole was then drawn through semicircular grooves which, in firmly pressing the strips around the conductor, caused them to unite at the edges (while the compound was still warm and immediately after the strips had been cut), and thus form a complete cylindrical casing for the conductor. The spare rubber from each strip was at the same time trimmed off at the sides by small circular cutters, close to the rollers. This plan was a great improvement in some respects, as it overcame the objection to unevenness of covering due to an overlapping seam.

When more than one covering was applied, to withstand high voltages, the joining lines of the successive layers were placed at right angles to each other. Difficulty was experienced by some manufacturers in having the seams of the rubber strips unite sufficiently to overcome dampness which might creep into the conductor when the wires were placed underground or submerged. This led to the starting of the second school of insulation known as the seamless method, which was distinctly American, and in opposition to the Siemens process.

The rubber compound by this process was not necessarily calendered or cut into strips, but was taken direct from the compounding mill and fed into a screw machine which forced the rubber in a compact and seamless mass around the conductor as it emerged from a die in the end of the machine. This process proved so satisfactory for high tension work that it induced an American company to enter the field for the production of submarine cables, which up to 1890 had been held almost exclusively by English manufacturers. The first cable of this character to be put in successful operation was laid during the Spanish-American war by the cable ship Hooker, of the United States army signal corps, and under the command of Colonel James Allen.

South African Farm Telephones

According to *African World,* in connection with the inquiries set afoot by the South African National Union about farm telephones in the various South African colonies, the acting postmaster-general of the Transvaal gives the following details of proposed extensions in that state:

It is intended to erect main trunk lines, to communicate with Pretoria and the Rand from Klerksdorp, Volksrust, Belfast, Zeerust and Pietersburg. Connected with these main routes will be a large number of subsidiary trunk lines, and when the whole are erected it will be possible to speak easily from one end of the Transvaal to the other. Few farms will be far removed from a line when this program is completed, and connections with farms will be given to the nearest available point on the lines. All connections will be taken to an exchange. The exchange fixed charge of $37 per annum will be payable by all subscribers, and the only addition to this for farmers will be ten per cent of the cost of their lines outside the exchange areas, existing lines being used as far as possible to minimize this cost. If, for instance, a farm is ten miles from an exchange, a trunk line from the exchange passing within two miles of the homestead, the charge would be $37 for the exchange service, covering a line of one mile from the exchange as center; for seven miles the circuit would be carried on the existing line, and for the remaining two miles a light line would be run across country to the homestead, ten per cent of this construction outside the exchange area being added to the subscription of $37.

Private Wire for the Tafts

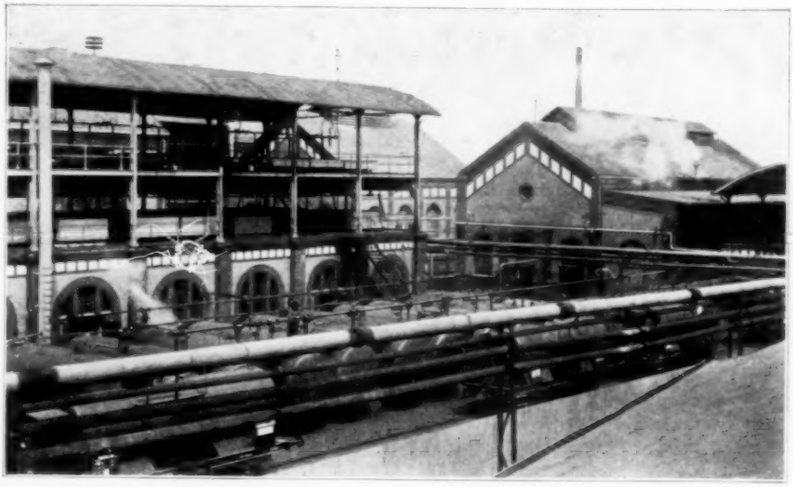
A private telephone wire from the house of Charles P. Taft in Cincinnati to the White House in Washington is being arranged. The 725 miles of wire will be at the service of Charles P. Taft from 6 p. m. to 6 a. m. No outside hands will manipulate the switchboard plugs and no outside ear will hear the conversations.

Construction versus Destruction

By Harry H. Gerhard

THE normal yearly production of poles in the United States is about 2,750,000, and today there are, approximately, over 50,000,000 poles supporting wires, either telephone, telegraph, light, or power. A question which you will frequently hear the user of poles ask is, "Why don't you show longer time tests on preserved poles?"

The answers to this question from the different wood preserving concerns are virtually the same and to the effect that it is only of recent years that the pole user could be induced to take the precaution of preserving his timber. Fifteen years ago it was practically impossible to get the owner of a pole line to "take a chance" on a preservative because he did not care to pay for an experience from which his successor would reap the profits in the event the treatment proved a failure. At that time there was little knowledge on timber preservation; hence, to promote the sale of a preservative its sellers were compelled to charge a large profit, which profit had to cover the expense of educating not only through literature but personal solicitation as well. And not only was he forced to educate but to offer inducements to the consumer and frequently to plead "Please try."



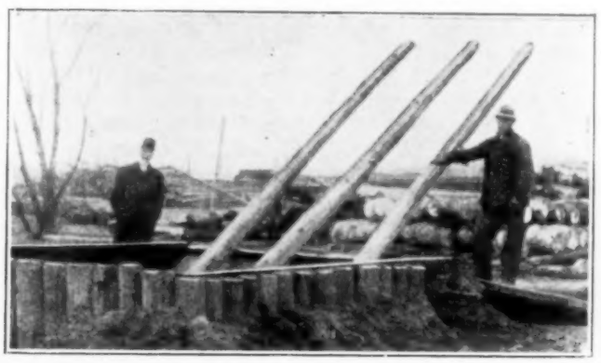
C-A-Wood-Preserver Company's Factory in Germany.

In the last few years, prompted by their increased price, there is hardly a pole set without the owner's having some idea of preserving it. He begins to compare what he or his predecessor formerly paid for a pole with the present price, hence he begins to figure and says to himself, "How can I stop this dividend-eating expense of replacing rotten poles?" If this manager or engineer has not brought the subject before the directors it is only a question of a short time until he will, for he is realizing what others are doing and is discovering the increased profit or decreased maintenance expense his competitor is obtaining by having preserved his poles years ago.

It is to be regretted that the engineering schools of the United States have seemed to overlook the fact that many of their graduates will some day be called upon to determine the advisability of using a preservative in their field of operation. As the schools do not embrace this subject of wood preservation in their courses it is impossible for the engineers to pass judgment on the value of a preservative unless they have learned from their own or others' experience and at the expense of their employers, who are the losers in the event the engineer advise the use of an inferior preservative.

Perhaps it may interest the reader to learn that the writer of this article has recently sent personal letters to 3,300 members of the American Society of Civil Engineers. These letters contained a request for information on the subject of wood preservation, and also a prepaid return envelope. From the 3,300 sent, about 500 replies have been received, seventy of the letters being returned on account of incorrect addresses. Out of these 500, less than ten claimed to have any knowledge whatever on the subject! It is natural to infer that most of

Pouring System of Treatment.



Valentine-Clark Company's Plant at St. Paul.

Commonly Used Brush Treatment.

Method of Treating Old Erected Poles.

the remaining number who have not answered are in the position of the overwhelming majority of those who have.

Many, not only the engineers, have become prejudiced on timber preservation because the preservative which they bought was offered and sold on the representation that it was a valuable secret, or a patented process, and which afterward proved a failure. Whether or not a pole owner has used a preservative it is recommended that he know what he is buying and guard against preservatives whose sellers refrain from stating what they contain. When the seller of a preservative objects to telling the trade what it contains he either admits its inferiority or fears the consumer's objecting to the exorbitant profits said seller is asking.

Since the records obtained in the past years show what ingredients remain in treated timbers the greatest period of time, it is natural to conclude that a good preservative should contain as great an amount of these ingredients as it is possible to obtain. The impregnating process, while one of the oldest methods known, is yet in its infancy. The records above referred to, however, are based on timbers which had been treated with a tar oil under pressure. This method if properly used is frequently so expensive that the additional cost makes its use prohibitory.

Although the following has been mentioned elsewhere, it bears too directly on the subject in hand to be omitted here. On reading Samuel B. Boulton's collection of data which was presented at Wye, England, 1885, under the title of "Wood Preservation by the Use of Antiseptics," one is led to the conclusion that it is the high boiling oils of coal tar which preserve timber, because that is what was obtained by subjecting the preserved timbers to dry distillation. The records do not show whether or not these high boiling oils originally contained any neutral, such as paraffin or similar oils, which have not as yet been proven germicidal. Bulletin No. 98 of the United States Forest Service virtually substantiates Mr. Boulton's findings, namely, that it was the high boiling oils in the coal tar distillate injected into the timber which brought about the best results and preserved said timber for periods of up to forty years.

The average tar oil obtainable, which is forced into timber under pressure, contains from 15 to 35 per cent oil distilling above 300 degrees centigrade. Hence, if an oil that contained 35 per cent distilling above 300 degrees centigrade, at most, which had been *injected* into the timber showed such excellent results, it is reasonable to suppose that a lesser amount of oil containing proportionally a *greater* per cent of distillate above 300 degrees centigrade will bring good results when properly applied. The above is one reason why the "superficial method" of treatment is worth considering; and the results derived by that method with a certain preservative will be mentioned later.

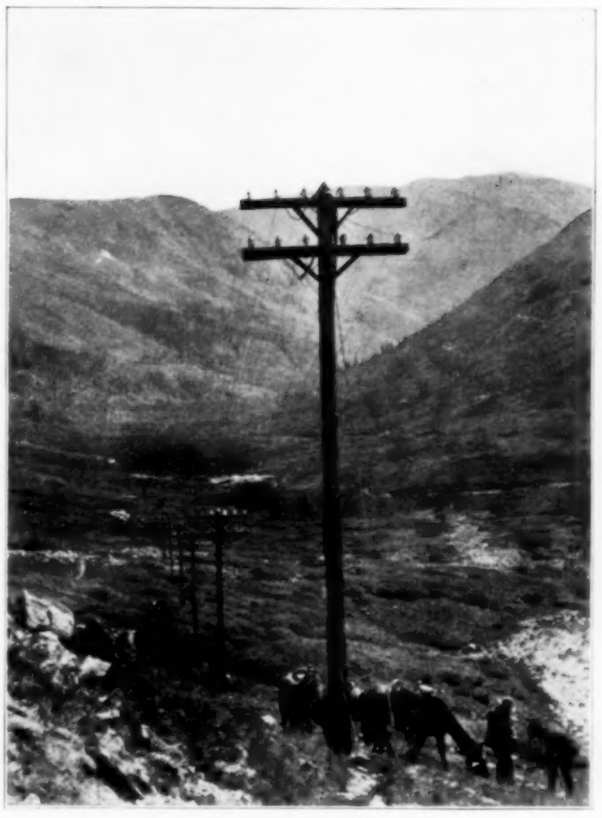
Of recent years some have had the idea that any crude petroleum was a preservative. This idea is perhaps due to the inexplicit publication relative to tests made with crude petroleum. Experiments have been made with the Bakersfield (Cal.) oil which to date are apparently flattering. But in all probability the success of the compound is due to the extremely large amount of that oil forced into the wood, and at not a very low cost. The failure of the printed reports of that one test to be explicit and state that it was the Bakersfield oil has proven an expensive experiment to some who supposed all petroleums were of equal merit or the same base. Hence, it is important for the one who supposes petroleum to be a preservative to exercise much care in the selection of the petroleum because it may prove an unwise form of economy, as it has done repeatedly.

While England and Germany as nations were looking to the protection of their timber supplies by replanting their forests, one man in England was looking for a means of preserving that timber already in and for use. He was searching for the preserving oils in coal and other products as well, which were to preserve timber, and the accompanying chart is a miniature reproduction of a copy of his findings termed the "Genealogical Tree." This design was copyrighted in England in 1886, but imitations of it have since been published in America. The writer of this article obtained special permission while in Europe last year to reprint this design.

From this chart one can readily note the variable oils derived by distillation, therefore it is opportune to direct attention to the investigation of articles offered as preservatives. It is suggested that the telephone companies, through their associations or otherwise, issue a

specification for their wood preservatives, especially for those to be applied by the superficial method, and to make the specification more rigid than any heretofore demanded by telephone companies. One of the largest telephone companies does issue a specification for its superficial wood preservative, but it is to be changed because the market is now being overrun by proprietary, so-called wood preservatives with a guarantee that they will meet the specification mentioned. This they may do, yet at the same time they are not coal tar products at all or are not entirely so. The United States Forest Service method of analysis is the only one to the present date which determines whether the so-called preservatives are coal tar products or contain nongermicidal residues or crude petroleum. The sulphonation test required and indices of refraction determine whether the oils are of a coal tar base or not. Therefore the consumer should insist that the sellers of these so-called preservatives give suitable guarantee that their preservatives are strictly *coal tar distillates free from nongermicidal oils*, and furnish an analysis made by the United States Forest Service method on what they offer as preservatives.

In 1900 the C-A-Wood-Preserver Company began directing attention to the value of high boiling tar oils as against the offered "secret" or "patented" processes in connection with preservatives. Since scientific investigations by the government and others have substantiated these theories and arguments, some are attempting to use preservatives which are the high boiling portions of crude petroleum. These mislead the chemist unless he make the sulphonation test. The company mentioned, in 1886, sold one of the first barrels of coal tar distillate that came to America. This product which was intended for the superficial method, distilled only 75 per cent above 300 degrees centigrade. Eleven years afterward this was increased to 85 per cent and during the summer of 1909 to 92 per cent. This was the highest mark reached so far and it required special machinery to produce it, part of which machinery is shown in the accompanying photograph.



Butt-Treated Poles in Rocky Mountain Line.

Butt-Treated Poles on Joint Pole Line, Memphis, Tenn.

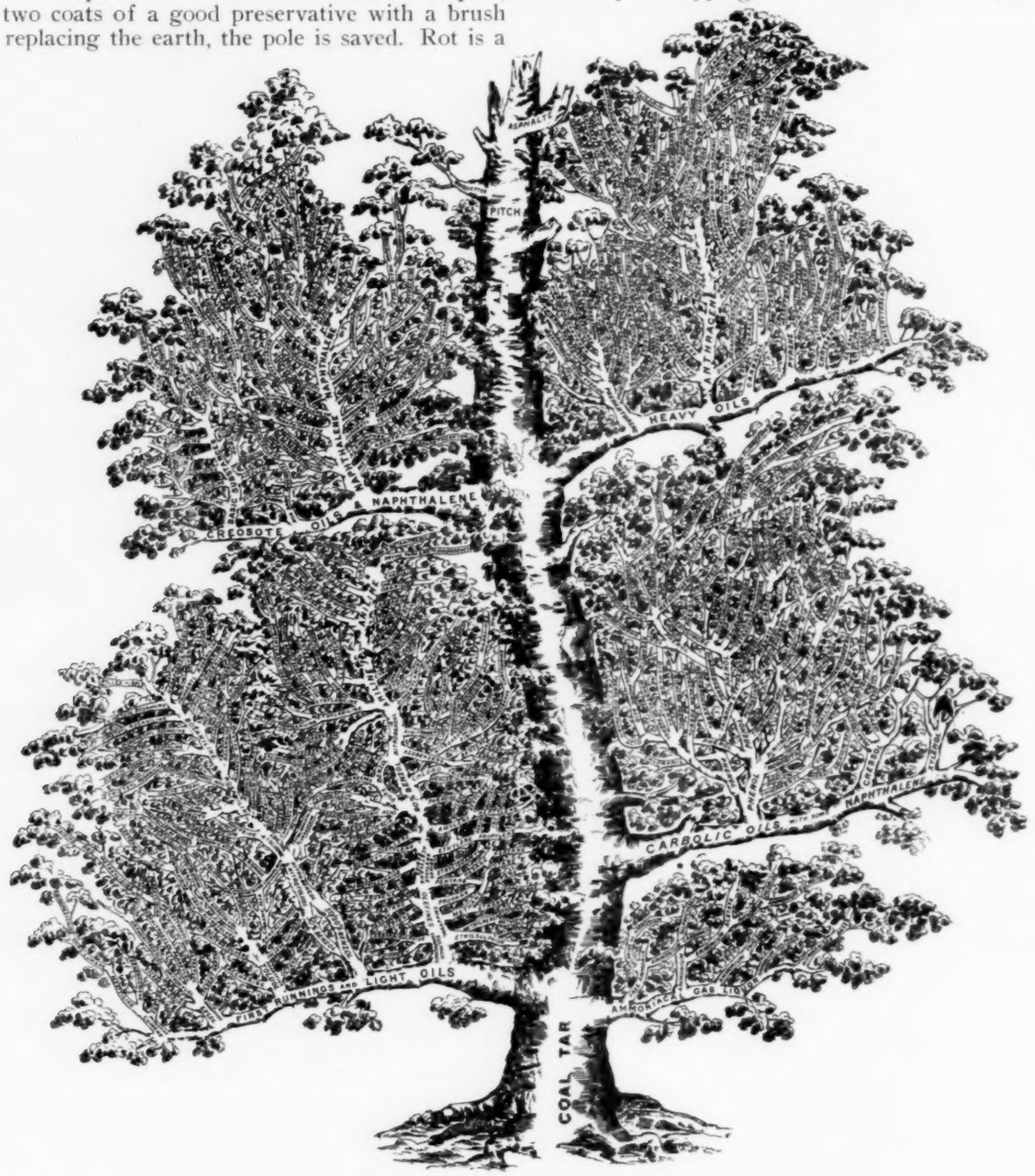
It is practically impossible to produce a successful oil distilling more than 92 per cent above 300 degrees centigrade according to the United States Forest Service method of analysis, as it would solidify at normal temperature if it were free from petroleum residues or similar oils. Some tars will distill much more than 92 per cent above 300 degrees centigrade, but they are not free from the paraffin oils which have a high boiling point though they are nongermicidal.

While it has been less than a year since a strictly coal tar distillate containing as much as 92 per cent liquid residue (oil) above 300 degrees centigrade (United States Forest Service method) has been manufactured and put on the market, it may be interesting to note a few records and illustrations of the methods of application and results derived from the use of that heretofore produced, or from the oil distilling 85 per cent above 300 degrees centigrade. After determining the quality of preservative, the pole user is interested in the method of application. The brush method is the simplest and most universally used and is shown in the illustration. Next is the pouring system which is done in two ways. One consists of a portable tank while the other is stationary, the poles being conveyed to the treating tank.

It is true that it is only in the last few years that pole

users have become interested in preserving their timber, yet it is not too late for many to profit by the experience of those who have stopped the present decay of poles which have been standing a few years. Poles which are already erected and which have begun to show decay can be saved by a very simple method. By digging away the earth to a depth of about two feet around the pole, applying two coats of a good preservative with a brush and then replacing the earth, the pole is saved. Rot is a bacteria or germ and the preservative being a germicide or antiseptic kills those present when applied to the decaying parts and its presence in the wood prevents future decay as well. The manager of the Memphis (Tenn.) Telephone Company, in 1904, made this experiment on cypress poles and he reports them in perfect condition today with every evidence of lasting many years longer. The Austin (Texas) Electric Railway Company has likewise found this a most successful experiment on cedar poles.

The illustration showing complete immersion of the butts of poles is the plant of the Valentine-Clark Company, at Minnesota Transfer (St. Paul), Minn., which was erected because many users of poles prefer buying their poles already treated with the highest grade oil known. Such poles are now being much called for. Cross arms can be treated by the brush method, however, the complete dipping or immersion is the more favorable.



The Wood-Preserver Genealogical Tree.

The cost of treating a pole depends upon its size, character, condition, price of the preservative and the amount used—whether it be treated at the ground line only or the entire butt end. There is a variation from four cents to perhaps a dollar per pole and each user of poles knows best what he can afford to pay for the protection of his timber.

Last, but not the least important, it should be noted that under no circumstances should unseasoned or green timber be treated, regardless of the preservative used; it must be at least partly seasoned to allow penetration.

What One Woman Thinks

By Sarah Elizabeth Brown

ONE of my dearest "girl" friends, Miss Anna Morrison, has written me a long letter from Lincoln—the town made famous by the president of the National Association, or the system he has, or maybe both. Anna is a great girl when it comes to doing charitable stunts. She used to be in Marcey Home, Chicago, but the work was too hard for her. I'm sure you don't know what a great work Marcey Home is doing in your city. It isn't so big as Hull House, but it performs a similar service—gets down closer to those Greeks and "Guineas," if I'm a judge. I was there only once, but I saw enough to make me feel comfortable with my own lot, and it made me shed a few tears for those poor creatures who depend upon the Home for the only blessings they ever seem to have. But how I do ramble around! I was going to tell you about the letter Miss Morrison sent me, or, rather, about the contents of it. In it she told about a recent "slugfest" between the sophomores and freshmen at the university campus.

They called it a game—an Olympic game. The name doesn't mean or suggest anything. The students, two hundred freshies on one side and a hundred sophs on the other, lined up at either end of the field. In the center three of each side held a canvas six feet square. At a signal both ends rushed to the center for that precious bit of cloth. The object was to drag that canvas and everybody who could hang on to it across the goal line. There were referees, chosen from the faculty, but what could they hope to do in a scrimmage of three hundred crazy kids? I believe the sophs won, although they were fewest in number, but they had been through it before and had had experience. The freshies of this year, the sophs of next year, will probably win next year. That is usually the way.

While I was reading Ann's letter, I couldn't help comparing that student game to the telephone game.

Let the canvas represent the telephone business. Let the freshmen represent the independents. Let the sophomores represent the Bell. I'll blow the whistle. Bingo—there it is! Pull and tug and strike! Drag it around, first one way and then the other. Belittle it; defame it; yell robber, thief, pandemonium! Doesn't it make a comparison? Then there's the referee—the college faculty—the highbrows! That's the bunch who try to run things in Boston, who try to tell Salt Lake what the rate should be in Butte. Just as efficient as the college faculty, isn't it—especially in trying to put into operation a code of rules that would be effective in a general melee?

* * *

I am always wondering why telephone men have the patience to struggle blindly on and on, trying to do before they are done, when there are so many examples of competitors in other lines who display more sense. The country is full of industrial associations who meet and discuss price regulation. No one ever jumps on to these conventions where such discussions prevail. They arrive at better understandings of costs and methods of doing business. Obediah is going to the Topeka convention, which will just about be over when this appears in print; but it is certain sure that he won't be repaid for going there. A great association of telephone operators might accomplish something, but we will never have it until the little groups of operators adopt rules that will hold. If competing lines are doing a satisfactory business between two points—all the business they can do, doesn't it seem that a cut in the rate by either party is about as foolish a thing as might well be conceived? I know case after case like this. It occurs to me that there is no comparison. If I had a purse with a hole in it and continued the use of the purse without fixing the hole, I shouldn't feel bad if I lost money. Well, when everybody is satisfied with a toll rate between places and the circuits of both companies are busy all the time, why should one cut the rate from 35 cents to 25 cents? I shall always expect this thing to go on until we have local associations of all operators.

* * *

There is one thing I like about the Bell company—it is always making a noise about the money it makes. And what is more, it tells us something about it, in a hazy sort of a way, but who cares? The thing that makes a hit with me is the amount it earned last year—the gross amount extracted from the public. Think of it!—$150,000,000 for palaver over only a part of the telephone system of this country. If the independents took in a like sum, and I'm sure they did, we would have telephone rentals and toll service fees amounting to $300,000,000 a year! That's a business, all right, all right. And yet I have just finished reading an article that tells me the rats of this country cost us nearly twice as much.

Well, the rats in our neck of the woods are nearly as scarce as Bell telephones, but even at that, it is harder for me to comprehend the Bell figures than it is the rat story. I know that the Bell is strong in the big cities—some of them—and that Chicago spends $9,000,000 a year to talk, but $150,000,000 is a terrible lot of money! What a pity we haven't got the independent figures! There should be some dependable statistics. Why, it has got to a place where no one seems to be brave enough even to guess. I'm brave enough, but what's the use? If I were to dally with big figures they wouldn't mean anything as a record, so I will simply believe that the independent telephone systems earned as much or more money than the Bell company did in the same length of time.

Rather than be a statistician, I'll stick to the housework. It is more in my line to ladle the butter out of Tuesday's and Thursday's churning and mull it around afterwards in the bowl on my lap until it is ready for the icebox. I can comprehend a job like that. I know the whole system. I know that Bess will be fresh next week and that old Muley can always be depended upon for two quarts at a milking and that Roan and Crumpy and Red will contribute enough more to fill the pails. Over there on that shelf by the woodshed are the crocks and on a nail just above them is the shining strainer. The milk buckets are ready for the evening. The cows will drift in from the pasture through that lane just back of the barn. Those two big pails and that little one which Minnie uses to feed the cats will take care of the gross output. There will be no depreciation, unless there is an accident. It is an easy problem. There will be enough butter for the family and I'll have some to sell.

When I churn there will be the kittens on the rug on the back porch rioting with trivial things. It won't

be long till they will be chasing flies. The buttermilk will go to the shoats—they like it whether Taft does or not. It is that way every year; has been for a long time now. I read the Bell annual report about the time that that Siberian crabtree over in the corner of the back yard is in full bloom and everything is about the same in my daily routine and in the report—except that the report is always showing larger gross receipts and, in a vague sort of way, telling what becomes of the money. In a general way I know that it must be so, for Obediah's annual report always shows larger and larger, and we know it means a better business. I tell you, brothers, this telephone business is a good business.

But there is too much rant and cant in it! There is too much looking backwards and too little looking ahead. Nearly everything I read, outside of this particular little green-backed book, starts off by saying: "Fifteen years ago." Of course, there wasn't anything then but a Bell telephone! I'm getting bold—even Obediah concedes that the Bell company, 'way back there, was acting within its rights by protecting its patents. I'll grant you that from our selfish point of view (remember that we operate an independent system) the Bell did some foolish things then as it does now, but these "fifteen years ago" stories make me tired!

Let's talk and think about the now and henceforth of things in the telephone business. At any rate, let's call it a good business—a $300,000,000 a year business for palaver! Hustle, everybody, and make it support our rats!

* * *

It is my notion that independent telephone men are a jealous lot and that the Bell people are a selfish lot. Time—right now—apologies to nobody! Let us reason together for a moment. The Bell Telephone Company, by its old policy of selling to itself alone, conserved territory for independents—gave the independents an exclusive field. As long as the Bell company refused to sell its apparatus to anyone but itself, all the rest of the field was open to the independents. The independents were busy in the pastures where there were no signs: "Keep off the grass." When the Bell decided upon the change of policy which said it would sell everything, everywhere; the gates were down and the independents had a new problem to face. The independents in their conventions and elsewhere yelled back defiantly, *"Raus mit' em!* We will not buy!" The manufacturers of independent telephones said to the operators, you must stand by us; you must buy our goods at the best price we can afford to name. The Bell company cannot make stuff as good as ours, and if their price is lower than ours you will get inferior goods; besides, who made it possible for you to build independent exchanges?

* * *

That was three years ago. There was very little logic in the arguments which the independents put forth. There wasn't a bit of substantial business sense. If the Bell company by its previous selfishness had left open a field which the independents had zealously and jealously developed, the announcement that the Bell would invade that same field as a competitor meant a radical change of program. It meant a contest not as between independents themselves, but rather as between the Bell and all the independents.

The Bell company with its great organization proceeded to force its way. Not familiar with the requirements of the public, outside its own bailiwick, or the independent market in general, price-cutting was adopted as the entering wedge. The mistake cost the Bell much money. On the other hand, the mistaken idea that there was enough loyalty among the independents to support each other cost the independent manufacturer much money. The panic followed and as a result neither the Bell nor the independent manufacturer had anything but trouble. The business was all shot to pieces and prices were demoralized.

Again, when the selfish Bell refused to connect with the jealous independent operator, the independent exchange business thrived. The promoter was rampant and with his big come-on, easy-money smile, he started operating plants where none were needed. If the farmers were not happy with their dollar a month independent service, they were encouraged to start a co-operative plant of their own and serve themselves. This was a plain case of independent demoralization. I cannot imagine any policy which would work more havoc. If the independents had taken advantage of their great strength when left alone, they might have prevented some of the evils I have mentioned. They might have been strong enough to have effectively blocked any Bell movement. It is most unfortunate that the operators during the years and years that they went to their conventions and behind closed doors solemnly excluded any Bell attache, failed to accomplish anything that would serve them in a crucial time. There has never been the co-operation among independents that would serve the whole industry for long at a time. Now we have the new problem and we will get along with it as individuals.

Forecasts by Telephone

By the co-operation of the Southeastern Telegraph and Telephone Company with the Houston, Tex., weather observatory, 100,000 Texas homes and places of business will be enabled to receive the daily weather forecasts and warnings within a few hours after their issuance. Dr. B. Bunnemeyer, section director of the local observatory, has had negotiations under way with the telephone company for some time, and during the past month a system was devised whereby the subscribers to the company situated in all parts of the state would be able to receive the reports without undue work on the part of the company. Announcement was made by the weather office that the system would be inaugurated April 18, and printed slips to that effect were sent to all subscribers of the company.

City subscribers, of which there are about 80,000, can obtain the reports and warnings any hour of the day after 10 o'clock in the morning by calling their exchange and asking "central." On each exchange desk a printed slip will contain the weather forecasts, reports and special warnings.

Rural subscribers will be called about noon each day by one long ring. When all lines are open, or a sufficient period of time has elapsed, the operator will read off the forecast, reports and other data that may be included. These forecasts will be especially valuable to rural subscribers, as they usually cover the thirty-six-hour period ending at 8 p. m. on the following day. Under the old method of mailing these forecasts their delivery was so delayed that in almost all cases they were useless. The books of the telephone company show about 20,000 rural subscribers, and because of danger to their crops and the amount of produce that can be saved by timely warning, the new service, it is believed, will be especially valuable.

Who's Who in the Telephone Game

Facts and Fancies About a Man You Know or Ought to Know

FROM this point, let your gaze follow a southeasterly course and you will observe a picture on this page that was taken some time ago. It is a near-likeness of S. P. Grace, who has changed since this photo was made. He's handsomer now. His wife says so, which precludes all possibility for argument. If you are married, you know how it is yourself.

But Grace can't help being handsome even if he is a telephone engineer. He acquired the latter—dug it out of the University of Michigan and graduated in 1896 with the credentials properly executed in his favor. He planned everything just right—a habit real engineers have by virtue of their training. The specifications for Grace's graduation called for the completion of his electrical engineering course at the age of twenty-one. He has the original tracing cloth to show for it. There wasn't a chance that he would not come through with flying colors, so he came through that way. And as a graduate telephone engineer, he went to work the very next day, having in charge the engineering and construction of the telephone plants that were promoted and built in Michigan and other parts of the United States by a Detroit syndicate. For three years Grace was the busiest college grad. that ever tackled independent telephony. He was engineer for the Detroit Telephone Company; engineer for the New State Telephone Company of Michigan; chief engineer for the Detroit Switchboard Construction Company, and chief engineer and manager of the People's Telephone Company of New Orleans, all at once. It is a hopeful sign when an ambitious young man can surround himself with all the comforts of home and a student lamp and equip himself to tackle a two-fisted job like that and get away with it. While at New Orleans Grace found time to build the first conduit system for electric wires that ever went underground in the Crescent City. It was a job that would tax an older head. Conditions were simply awful in that town. Dig a hole a foot deep and you would strike water. The ground was so soft that the trenches could not be left open over night without being full of water the next morning. The completed work has stood for years as the first successful example of submarine conduit installation. Then, for fear he might go stale, the board of trade employed him as expert in a telephone rate investigation that had followed some early muckraker. Grace, meantime, was the busiest little thing south of Mason and Dixon's line, hanging on to all of his jobs. And right there came the calamity—the Bell bought all of his companies and sent him a wire that his services were no longer required. It was a sad, sad piece of news. It is hard for some people to lose a single job. Think of losing a half dozen.

He Has a Nice Easy Way of Saying Smooth Things.

That was in 1899, but it wasn't long before he had joined forces with the Glidden interests who controlled the old Erie system—Bell. The Erie was the holding company of the old Michigan Telephone Company of Michigan; the Wisconsin; the Minnesota; North and South Dakota; Texas and Arkansas. Here was offered a variety of engineering problems. Grace was finally sent into Texas as superintendent-engineer in charge of modernizing the plants of the Southwestern T. & T. Company.

In 1901 the big independent operations of an Ohio crowd were extended to Texas and Grace was employed to develop certain properties in Texas—a shift back into the independent camp. He was general manager of the Beaumont system when oil was discovered in that region. But here his health demanded a return to the north, and leaving Beaumont he accepted the position of chief engineer for the Interstate Telephone and Telegraph Company of New Jersey; headquarters, Trenton. When a live independent begins to do things telephonically on the very threshold of the Bell stronghold, the emoluments of the big company reach out for him. Grace was taken back into the Bell fold in 1902. He was enrolled upon the engineering staff of the A. T. & T. Company at Boston, where he remained for one brief year. In 1903 he was sent to Pittsburg, where he donned the mantle of the chief engineer of the Central District and Printing Telegraph Company. He is with this concern yet—now superintendent of plant.

If you ever go to Pittsburg and get lost in the smoke banks, call him up. He's the encyclopedia and directory of the place. He has a nice easy way of saying smooth things and what he doesn't know about the C. D. & P. T. C.'s business won't bother anybody.

That is Grace's record and it shows plainly that he has never been idle a moment: that he has been

on both sides of the operating fence and that he has made good. It has been a busy career for such a short span of years. Grace is avowedly a Bell man, but somehow he has always been closer to the independents than the average Bell man can get. The telephone press is eager to print his contributions to its literature, and for some unexplainable reason Grace has had more to offer than most Bell men. The good Bell stuff is usually canned. Grace's is too good to can. Everybody insists upon it while it is fresh. He is one of the first telephone engineers to apply engineering principles to exchange construction. His contributions to technical telephone literature have been along this line and his methods and appliances are conceded by all experts to be standard.

Sergius Paul Grace was born in Farmington, Michigan, October 11, 1875. It was natural for him to take to engineering. He comes from that kind of a family. A hundred years before Grace was building a telephone line along the banks of the old Delaware and Rariton Canal, his great grandfather was the civil and construction engineer having in charge the digging of the canal itself. That particular job offered some unusual reminiscenses for Sergius P., who must have made some interesting mental comparisons in transmission practice.

S. P. Grace, like others who achieve, finds much to do in his private laboratory. This is in the loft of his residence. He has current of all kinds on tap up there—d. c. or a. c. from .01 to 200,000,000 volts, or something like that. His equipment includes motors, dynamos, coils, lathes and tools of every sort that can be used by a fan who would know about their use. While retaining active membership in the University and Columbus clubs of Pittsburg, this practical playhouse at home takes most of his leisure time. And the house is on Squirrel Hill—think that over, calmly—don't make a joke of it, for Sergius Paul Grace is not even remotely related to the Nutt family.

Independent Situation in Chicago

The Subway Telephone Construction Company of Chicago, in dealing with what is generally termed the Chicago situation, is rapidly reaching the desired point which will show results. It has entered full-page advertisements in all the Chicago papers, has mailed contracts to all business firms in Chicago, and reports even better advance than it had hoped for. At the date we go to press the company's solicitors have been out in the field for two weeks, and report that people who want outside and quicker connections are rapidly signing up. The new company promises delivery of apparatus during the month of May and with Bernard C. Groh as engineer in charge of construction will fully live up to its promises. At this date the organization has not been fully made up, but with Mr. Groh in active charge of work and Mr. J. C. Kenny installed as purchasing agent, the necessary steps can be made to insure the Chicago public a live automatic telephone system in the near future.

The following statements are credited to those interested in the new movement in Chicago:

David R. Forgan, receiver for the Illinois Tunnel Company:

"The bulk of the telephone business in Chicago's business district is such that another company may come in and take over 20,000 telephones without interfering with the Chicago concern. I do not think there is any question but that we will get the required number of telephone users. In fact, it is stipulated in Mr. Harris' contract that he must get the subscribers or he does not get paid."

Joseph Harris, president of the Subway Telephone Construction Company and the Automatic Electric Company:

"There is absolutely no question about getting the subscribers. Judging from the manner in which the telephones have been received I feel certain that we can get the required number of users before June 1, 1911. We are going to install a perfected instrument that a child can operate and that leaves no opportunity for error."

B. E. Sunny, president of the Chicago Telephone Company:

"I don't believe that even if they get their 20,000 telephones it can interfere with our business. The natural aversion of the average man to having to use two telephones, as well as the fact that this experiment has been tried once before, strengthens the belief that this is an unwise and ill-advised move."

Corporation's Instructions to Employes

The Commonwealth Edison Company, of Chicago, has issued the following instructions to its employes:

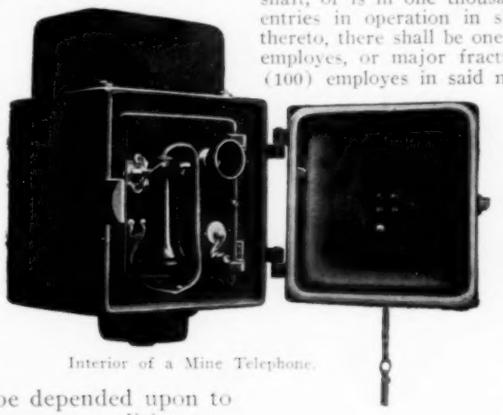
"Courtesy is the outward expression of breeding and character. Its practice is founded upon the golden rule of 'Doing unto others as you would they should do unto you.' In very few industries is the need of courtesy more imperative than in ours; the business of manufacturing and supplying electric light and power is, to the layman, peculiarly technical and mysterious. He does not comprehend its complicated processes, and he resents its apparent mystery. In dealing with this type of man, who cannot understand why his service is not connected within twenty-four hours after signing an application, or why he should have to obtain city inspection on his power installation, our employees have daily opportunities for showing the quality of their courtesy. It is necessary for them to remember that the customer is unacquainted with many conditions with which they are thoroughly familiar, and in imparting this knowledge to the customer, they should not do so with any assumption of superiority, or any display of impatience. The favorable impression made upon a customer who takes up his telephone to register a vigorous complaint, and who finds a courteous employee at the other end of the wire quick to understand his difficulties and eager to remedy them, cannot be overestimated. From being one of its severest critics, the customer becomes one of the company's best friends; he is usually gratified to recognize the courtesy with which he has been treated, and does not hesitate to advise it amongst his friends.

"After a call has been received on the telephone, and it is desired to signal our operator, care should be taken to flash slowly, as the signal lamps on the switchboard will not light up if the receiver hook is moved up and rown rapidly. If, on an original call, or on a flash signal, the operator does not respond within a reasonable time, the matter should be at once reported over another telephone to the chief operator, who will thus have an opportunity to ascertain if the corresponding signal lamp on the switchboard is burned out."

Mine Telephones

By E. O. Munson

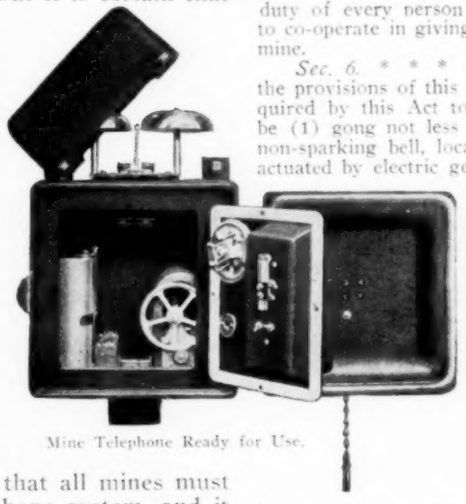
WITHOUT a telephone it would be impossible to carry on business the way it is conducted in these modern times. One is astounded when one looks over the statistics furnished by various operating telephone companies and sees the number of calls that go through their exchanges every day. Even in the rural districts, perhaps miles from the nearest railroad or postoffice, the telephone may be found, and the farmer has direct communication with his neighbors or with the city, no matter how isolated he may be. We also find the telephone on railroad trains, steamboats and, in fact, there is hardly a place where it is not used; but one of the most important uses of all at the present time is in the mines.



Interior of a Mine Telephone.

It is only within the last few years that a telephone has been manufactured which could be depended upon to give perfect service under the severe conditions to which it would be subjected in a mine.

The large number of mine disasters which have occurred recently has emphasized more than ever the need of a reliable mine telephone system. In an editorial appearing in one of the leading mine papers on the Cherry coal mine disaster, it was stated that at probably no time in the history of mining has there been a stronger demonstration of the great need of telephones in mines. How many lives could have been saved had the mine been fully equipped with telephones is entirely problematical, but it is certain that the number would have been greater had opportunity been afforded for communication between the rescuers and the entombed men. Oftentimes, after an explosion occurs, the rescuers are handicapped in their work by not knowing where the entombed men have taken refuge, and every minute wasted may cost scores of lives. Even though the men are shut in by tons of coal and debris, by having a telephone within their reach they are able to communicate with the outer world and give instructions that will tend toward their more speedy rescue.



Mine Telephone Ready for Use.

The legislature of the state of Illinois recently passed a law that all mines must be equipped with a reliable telephone system, and it is the writer's opinion that the time is not far off when all mining companies in this country will be obliged to equip their mines with a telephone system. The new Illinois law, in its telephone requirements, reads as follows, drastic penalties being provided for failure to observe its provisions:

Sec. 5. There shall be a system of party line telephones which shall include one telephone on the surface not more than one hundred (100) feet from the tipple, and one at the bottom of the hoisting shaft, or, in slope or drift mines, at the first cross entries in operation; and, in addition thereto, there shall be one telephone on each side of the mine when such side is in more than one thousand (1,000) feet from the bottom of the hoisting shaft, or is in one thousand (1,000) feet beyond the first cross entries in operation in slope or drift mines; and, in addition thereto, there shall be one telephone for each one hundred (100) employes, or major fraction thereof in excess of one hundred (100) employes in said mines.

There shall be an electric gong signal system actuated by an electric generator current and operated from the bottom of the hoisting shaft or from the tipple in slope or drift mines. The wires shall be of not less carrying capacity than No. 12 iron wire. The gongs shall be not less than eight (8) inches in diameter. Only non-sparking bells shall be used.

In pillar and room mines there shall be a gong in one entry of each pair of entries, not more than two hundred and fifty (250) feet from the face of said entry. In long wall mines there shall be one gong on each main heading in operation not more than two hundred and fifty (250) feet from the face of said entry. In long wall mines there shall be one gong on each main heading in operation not more than two hundred and fifty (250) feet from the face, and, in addition thereto, there shall be gongs on cross roads in operation off of main headings so there shall be one gong for not more than one thousand (1,000) feet of working face in operation.

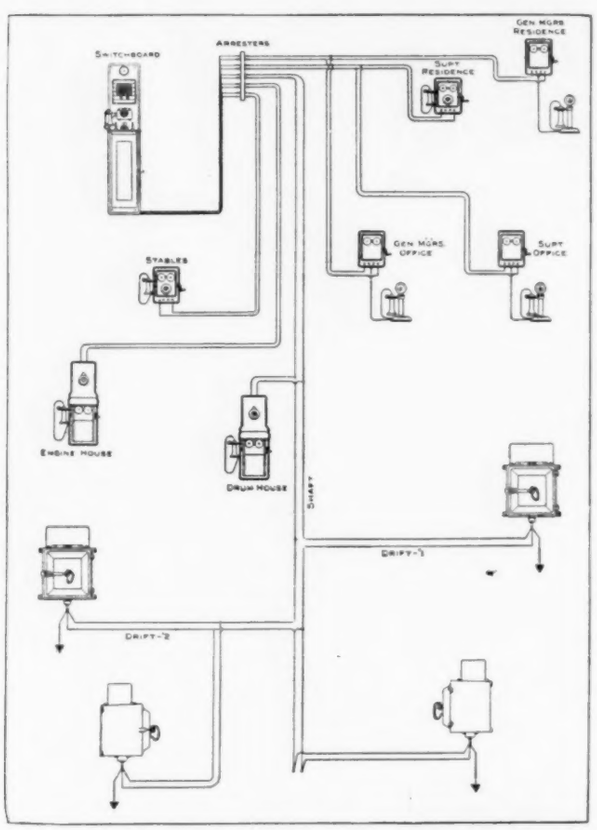
In the system of signals one long ring on said electric gongs shall signify "Danger, men go to the hoisting shaft"; a succession of short rings shall signify "Danger, men go to the escapement shaft." It shall be the special duty of all drivers, motormen and trip riders to notify all other drivers, motormen, trip riders or miners from whom they haul coal; and it shall be the duty of every person in the mine receiving such danger signal to co-operate in giving notice thereof to all other persons in the mine.

Sec. 6. * * * In mines constructed in accordance with the provisions of this section 6, in addition to the telephones required by this Act to be installed inside the mine, there shall be (1) gong not less than twelve (12) inches in diameter with non-sparking bell, located near each telephone inside the mine, actuated by electric generator current operated from the bottom of the hoisting shaft or from the tipple in slope and drift mines. On becoming aware of any serious danger requiring the inside employes to come out of the mine, it shall be the duty of the person having charge of the outside telephone immediately to ring the danger signal on the gongs and it shall be the duty of all persons who hear such danger signal or receive information thereof to co-operate in giving notice thereof to all other persons in the mine.

There are many arguments in favor of the mine telephone, but the most important is that it saves time. Every mine manager knows that each day the underground foreman finds he needs some supplies, or is obliged to consult with the superintendent on some important matter. Without a telephone at his command it is necessary for him to leave the mine, very often delaying the work of the men

until his return. This is valuable time lost, which might have been saved if the workings of the mine had been connected with the office by telephones, as well as having the business transacted with greater despatch.

Perhaps few people realize that the cost of constructing lines underground is less than on the surface. This is due to the fact that it is not necessary to erect poles. The wires are usually run through the rifts and down the shafts on standard wood brackets, equipped with regular glass insulators. In a large number of mines, rope haulage is used to convey ore to the surface. Where such is the case, a metallic signal-line is usually run along the side of the entry to transmit signals to the engineer, usually located at the surface entrance. If such a condition



Circuits of a Mine Telephone Installation.

exists it is only necessary to connect any required number of bridging telephones to the circuit, the haulage strand and the signal wire. In this case no expense is incurred beyond the first cost of the telephone and the cost of connecting them to each station. The expense of maintenance is usually very light because the lines, being underground, are not subject to atmospheric conditions that are present outside, and trouble from lightning is, of course, unknown.

Although ordinary iron line wire has been used with success in some mines, the safest construction can be furnished at little additional cost by supplementing rubber-covered wire for all underground circuits which are in any way subject to moisture or dampness from contact with fresh earth and timbers used as supporting members in rifts. In some mines conditions are so uncertain that it is considered good practice to use lead-covered cable, providing the installation warrants the expense. In any event, this part of the equipment should not be slighted, and the best is always the cheapest. By installing a cable an increased degree of certainty is assured.

Herewith is shown a wiring diagram of a complete mine telephone system. The telephone used in the mine is of far different construction from the instrument used in ordinary telephone work. The mine telephone made by the Stromberg-Carlson Company, for example, consists of a complete magneto equipment, compactly assembled in a comparatively small, strong, cast-iron box, coated with a special enamel finish, which acid fumes and moisture cannot penetrate. All of the talking and signaling apparatus is accessibly arranged inside of an inner compartment, temporarily sealed tight by a door having a wide overlap covered with felt cloth gasket, as shown in the illustrations. The inner compartment is made sufficiently roomy to allow any part to be removed without interfering with the general assembly.

All openings through the inner case for the ringer cores and the generator crank must be sealed by gaskets and felt washers. The terminal box mounted on the bottom side of the telephone shown here conceals three terminal posts for the incoming line-wires, and is threaded to receive an iron pipe for bringing the line-wires from the ground to the telephone. The ringer armature and gongs are under the hood on top of the telephone, and are accessible for adjustment from the outside of the inner compartment, causing no reason for this compartment to be opened at any time except when replacing batteries, which is very seldom. Opening the outer door exposes the receiver and weather-proof cord, transmitter mouthpiece and generator crank, which are the only parts of the telephone necessarily required to be instantly accessible.

As an additional protection from atmospheric conditions, all insulated wire windings should be specially insulated and boiled in oil. The metal parts, necessarily of steel or iron, are zinc or copper-plated, while other parts, such as screws, are made of brass to prevent corrosion and rust.

Florida Convention

The Florida Independent Telephone Association held its annual convention in Jacksonville, April 7 and 8. The closing session of the association, which met at the Board of Trade auditorium, came to a close with the appointment of officers for the ensuing year, as follows:

W. G. Brorein, president, Tampa; W. L. Moor, vice-president, Tallahassee; E. E. Voyle, secretary and treasurer, Gainesville.

The convention was most successful and the members were enthusiastic over the outlook for the future. They were delighted with Jacksonville and expressed appreciation for the many courtesies extended them while in the state's metropolis.

An invitation being extended by the Tallahassee board of trade and the city council of that town for the next convention to be held in that city, the telephone men voted to hold the convention of 1911 in the capital city.

The last night's banquet at the Duval Hotel was a very interesting affair. About 100 persons participated. A number of addresses were made.

Report of the Wisconsin Commission

Telephone Investigation in the Badger State

IN order to ascertain the quality of telephone service afforded by the various exchanges in Wisconsin, and also to obtain a definite idea as to what might be considered "adequate service," an investigation was made by the State Railroad Commission of twenty-five telephone exchanges in the eighteen largest cities of the state, during the months of October and November, 1909. An inspector, equipped with a double-hand, split-second stop-watch, visited the cities in turn, testing in secret the service at each exchange. The method pursued was substantially as follows:

A total of 112 calls was made on each exchange, the inspector getting the time of response of central and subscriber by the stop-watch; that is, the moment he lifted the receiver from the hook, or began turning the crank, he would start both hands of the stop-watch. The instant the operator answered "Number," he would stop one hand of the watch, and the instant the called subscriber answered "Hello," he stopped the other hand of the watch. This gave the time of answer by central and by party to the nearest fraction of a second. Other points were also noted in the service; such as the percentage of "wrong number" calls; the percentage of "busy" and "don't answer" reports and the time required to report same; the percentage of calls answered in five seconds or less, and the amount of supervision or attention to calls given by the operator; that is, the operator asks: "Did you get them?" or "I'll ring again," or otherwise supervises the call. Out of each 112 calls made, 12 were made from pay stations in order to ascertain the quality of service afforded to those using this class of equipment.

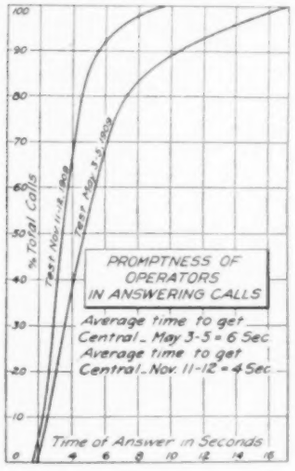

% Total Calls
PROMPTNESS OF OPERATORS IN ANSWERING CALLS
Average time to get Central - May 3-5 = 6 Sec.
Average time to get Central - Nov. 11-12 = 4 Sec.
Time of Answer in Seconds

Fig. 1.

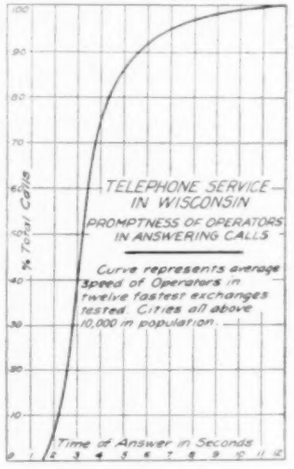

% Total Calls
TELEPHONE SERVICE IN WISCONSIN
PROMPTNESS OF OPERATORS IN ANSWERING CALLS
Curve represents average speed of Operators in twelve fastest exchanges tested. Cities all above 10,000 in population.
Time of Answer in Seconds

Fig. 2.

The results of this test are shown in the accompanying diagrammatic curves in which, for obvious reasons, the identity of the several exchanges is withheld.

From this table it will be noticed that the character of service afforded by the different exchanges varied through wide limits. The time required by central to answer calls was twice as long in some exchanges as in others. From an average of all the calls made during the test, it was found that the total average response of 24 exchanges was 4.78 seconds; the quickest average response by central for any one exchange was 3.17 seconds (at Oshkosh), while the slowest average response for any one exchange was 7.3 seconds. The average speed for the twelve fastest exchanges tested was 4 seconds. (See Fig. 2.)

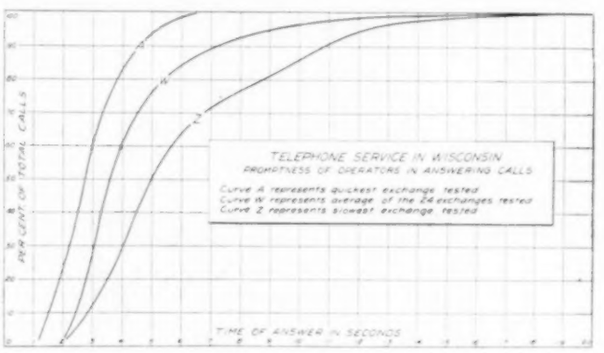

TELEPHONE SERVICE IN WISCONSIN
PROMPTNESS OF OPERATORS IN ANSWERING CALLS
Curve A represents quickest exchange tested
Curve W represents average of the 24 exchanges tested
Curve Z represents slowest exchange tested
PER CENT OF TOTAL CALLS
TIME OF ANSWER IN SECONDS

Fig. 3.

From a study of all the data taken during the test, supplemented by the inspector's opinion of the service afforded by each exchange, it was noted that in general the best service was given at those exchanges whose operators were very prompt in answering calls. The prompt operators were more alert in practically all matters of service than were those operators who required considerably more time to answer the subscriber's calls. In the exchanges where the operators were quite prompt, there were in general fewer "wrong number," "busy" and "don't answer" reports; "busy" and "don't answer" reports were quickly made, the called subscriber was obtained in shorter time, better supervision was exercised over calls; operators were more courteous and business-like; and all in all the degree of promptness in the main gave quite directly the quality of service afforded. Therefore, the "promptness of operators in answering calls" seemed to be the most important point in telephone service—transmission, equipment, etc., being equal. It is also a feature of the service which may be readily tested and standardized.

Upon the completion of the field tests, and after the data had all been carefully reviewed in the office, a general letter was sent out by the commission to the various exchanges concerned. This letter was accompanied by the tabulated summary of the test data and a blue print showing graphically the "promptness of operators in answering calls" for all the separate exchanges.

The accompanying diagram (Fig. 1) shows the promptness of operators in answering calls in an exchange in Wisconsin in a city of about 30,000 inhabitants. The first test was made August 3 and 5, 1909, and consisted of about 122 calls. Another test (not

*Third Annual Report of the Railroad Commission of Wisconsin.

shown) conducted in the latter part of September, showed approximately the same conditions of service. In the test made November 11 and 12, 1909, which was one of the regular series, will be noticed the considerable improvement effected. The average speed of answer in August was 6 seconds; in November this had been reduced to 4 seconds and the service otherwise generally improved.

It is proposed to repeat these tests from time to time, as this work can be done at small expense, and send the results to the various companies in the hope of securing a general betterment of service.

In addition to the formal tests of telephone service above described, advantage is taken of the fact that the various members of the engineering staff are obliged to travel about the state more or less in the discharge of their regular duties. The extent of this travel is described elsewhere in this report. These persons, as far as possible, are called upon to make incidental or informal tests of telephone service, following, in a general way, the method pursued in the systematic series of tests before mentioned. From five to eight calls are made upon the exchanges of the various cities visited and the data noted upon a form which includes the number and name of the party called, time required to answer by both operator and called party, time of test, and where the call was made from.

These routine tests are inspected in the office and then sent to the telephone exchange concerned, with an explanatory note if necessary. Where the inspector finds the service so poor as to warrant a more detailed test, he is supposed to either make same or report the conditions to the main office. Calls are always made to railroad stations upon which service there has been some complaint.

The larger cities of the state are visited several times each year, and any village having an electric light or gas plant is visited at least once, so that practically the entire telephone service of the state is covered by the inspectors. This movement is yet somewhat in its infancy, but its effect upon the telephone service has already been noted in specific instances.

Hearing on Boston Rate Revision

About one hundred persons, including telephone subscribers, attorneys for the New England Telephone and Telegraph Company, representatives of improvement societies and municipalities and others, were present when the Massachusetts Highway Commission opened a hearing on the proposed revision of Boston telephone rates and service. Harold Parker, chairman of the commission, presided, and with him were Commissioners Sohier and Kemp, and Professor D. C. Jackson, the expert who investigated the matter of telephone rates and service for the commission, and who recently made an exhaustive report, recommending, among other things, the adoption of the zone system of service. E. K. Hall appeared for the company, and Stoughton Bell for the Telephone Reform Association.

In opening the hearing, Chairman Parker outlined the methods that would be followed in conducting it, saying that Professor Jackson would explain his report, and that afterwards questions would be welcomed from all parties interested.

With the aid of a stereopticon, Professor Jackson began an explanation of his report. He said he would proceed upon lines laid down by the commission—first, what is a proper or ideal basis for rates; second, how to utilize such a basis, and third, the individual rates. The Boston and Suburban telephone district includes 430 square miles, and has 7 metropolitan exchanges in Boston and 44 suburban exchanges. There were in September, 112,700 telephones, including 36,331 extension sets. The radius of the district is about fifteen miles surrounding Boston. The metropolitan exchanges have 48,789, and the suburban 63,927 telephones. Professor Jackson said he entered the Boston telephone situation in the winter of 1907, when he was asked certain advice by the Highway Commission. As a result of that the five-cent toll to exchanges and the five-mile radius was put in effect and an inventory and a traffic study were undertaken. These studies have taught the telephone company more than it ever knew about its affairs.

Professor Jackson said that the making of telephone rates is a more complicated task than the making of railroad rates. Before anything could be done in Boston it was necessary to make an appraisal. This showed that the value of the plant in the Boston and suburban district in 1908, including the toll plant within the district, was $13,820,000. It would cost this to rebuild the plant on a very economical basis. The company has other current assets of $768,000 and a toll plant for outside business of $2,193,000. Thus, the total plant in the district was worth about $16,000,000, and net current assets otherwise of $768,000. Since 1908 the value of the plant has increased.

To show how the telephone affects everybody, Professor Jackson said the company has a local operator's position at its switchboards for every 1,200 people in the district. Methods used in the past have been founded only on individual judgment and business expediency. This was the only possible basis previous to the inventory, but it was not by any means satisfactory.

Professor Jackson then showed a series of charts by stereopticon slides. The average price per message in the district is 3½ cents. This is what it costs the customer. The private lines of the highest class pay on an average about 2 cents per message. Several other classes also pay below the average. There are many classes of service, however, that pay much above the average of 3½ cents, some as high as 7 and 8 cents. About two-thirds of the users pay more than the average price. Thus, the majority of the users are paying for the telephone service of the minority. This cannot be avoided with an unlimited service over so large a territory as the Boston and suburban district. Everybody using under ten calls a day has to pay over 4 cents a call under the present rates.

The cost to the company per message for exchange labor is about three-quarters of a cent, and about 2¾ per cent of the users in the $162 unlimited class are paying less than that amount. Some pay only one-quarter to one-half cent a message. To remedy this the numbers of calls or the district must be curtailed. Of the $162 unlimited class of subscribers a very large number are getting telephone service below the cost to the company.

A large part of the six-party suburban $25 service subscribers get service much below cost. The same is true of the four-party suburban service, about twenty-two per cent getting service at less than cost.

DEPARTMENT of RAILWAY TELEPHONES

Portable Telephones

By C. F. Bronson*

THE accompanying cuts illustrate the portable telephone set with which all Delaware Division passenger trains and wrecking outfits are equipped, as well as the method of using the same in bringing train crews into quick communication with the train despatcher.

The illustration on the next page shows the apparatus as carried on the trains. The young man is Telephone Inspector Kreiter, who looks after the division system. In the illustration on this page the man behind the gun is Conductor J. H. Fisher, of Train 1, holding an imaginary conversation with Susquehanna, while the men engaged at the supposedly broken side rod are Engineer S. Lucky and Fireman P. Krouse.

Using the Portable Telephone on Delaware Division.

Two occasions have arisen recently calling the apparatus into actual use. The first was on January 13 last, when Engine 2551 on Train 3 broke a side rod about one-half mile east of Cochecton station, and inside of four minutes after the break the conductor was in communication with the train despatcher and the latter was making his arrangements to get a relief engine to the scene.

Again, on January 22 Engine 2563 on Train 5 knocked out a cylinder head one mile east of PS Tower at 12:48 a. m., and at 12:52 a. m. the despatcher was fully advised of the occurrence. A relief engine was sent from Callicoon, which started Train 5 on its way at 1:30 a. m., with a total delay of 42 minutes. It is estimated by good authority that the delay without the telephone would have been at least one hour. Both the above occurrences were after dark, the second being about midnight. Probably with daylight to aid in locating the proper wires on the telegraph poles, communication could have been established in less time.

It is not alone in rushing information to headquarters concerning such accidents and getting help quickly that the portable sets show their value, but also in saving wear and tear on the despatcher's nerves. In the case of Train 5, above stated, the train left NO Tower about 12:43 a. m. and was expected at PS about the time of the accident. It would have taken from ten to fifteen minutes to get a man a mile west through the snow to the tower, and in the meantime the train despatcher would have been giving his imagination full sway in order to account for the non-appearance of the train at PS. A picture of the telegraph wire in such an emergency would be about as follows:

"PS PS PS GH—5 coming yet?"

"Not yet."

"NO NO NO GH—Can you see 5 up the track?"

"No, sir."

"Was she going all right when she passed?"

"Yes, sir."

"PS PS PS GH—Do you see her?"

"Not yet."

*Erie Railroad Employes' Magazine.

Department of Railway Telephones

This department is established as a permanent feature of TELEPHONE ENGINEER. The progress of the art of telephone train dispatching, its technical developments, its news, and the elucidation of its mysteries for the non-technical worker will be found each month in these pages. The editors invite the problems and solicit the co-operation of the many readers of TELEPHONE ENGINEER in all parts of the world whose interests lie along these lines.

Portable Telephones. By C. F. Bronson.....223-224
Norfolk and Southern to Install Telephones.....224
Los Angeles Meeting.....224
Railway Composite Installations. By Martin J. Ryan.....225-227
Telephone Dispatching in the Northwest.....227
Equipment on Southern Railway.....228
Virginian Railway to Equip Entire System.....228
Railway Telephone Patents.....228
Why Railroads Have Adopted Telephones. By Joseph J. Graf.....229-230
Railroad Information by Telephone.....230

"Go outside and see if you can hear her."
Interval—"Can't hear anything."
"Let me know when she's coming."
"O. K."
"NO NO NO GH—See if you can hear 5 west."
"East-bound passing, can't hear anything else."
"Listen when she's gone."
"O. K."

Despatcher sees his plans for moving up freights going to pieces, and makes remarks to himself which do not go on the wire. Gives 74 an order at CO to look out for No. 5 east of PS and report at NO what's the trouble. Gets after PS again.

"5 yet?"
"Not yet."
"Hear 'em?"
"No, sir."
"Let me know when she's coming."
"O. K."
"NO NO NO GH—Anything doing?"
"Can't hear a sound west."
"Watch out for 5's flag coming back and get"—

Telephone Inspector Kreiter.

Bzzt—PS breaks in—"See a light coming around curve."
"Is it a headlight?"
"Think it's a man."
"Get him in quick and see what he knows."
"O. K."

Then five minutes elapse while the man gets to the tower, files his report and has it sent. It outlines the trouble, states that they will help themselves, if possible, but asks for an engine anyhow. All this time the anxious despatcher has been spurring operators equally as anxious as himself to see trains move smoothly and the underlying and seldom recognized reason for it is the impatience which the despatcher feels under the restraints imposed by the telegraph. Such situations are extremely wearing on his nerves.

The quick communication afforded by the portable sets is, therefore, a relief, both to the despatcher and to his operators, to say nothing of their help in expediting train movements. The office knows exactly what is going on at the scene of the trouble, and the men on the ground are advised of what is being done for their relief and can be ready for it when it arrives.

Norfolk and Southern to Install Telephones

The Norfolk and Southern Railway is about to install a telephone train dispatching system on its main line from Norfolk to Washington. The equipment has already been ordered, and it is expected that the apparatus will be placed in service some time early this summer.

The telephone line over which dispatching will be done on this system consists of two heavy copper wires, each weighing 210 pounds to the mile, so that a grade of transmission of speech will be obtained equal to any furnished on the commercial telephone lines throughout the country. It is a very essential feature of a train dispatching circuit that the grade of speech obtained over it be first class and clear in every particular, and it is with this aim in view that the Norfolk and Southern have taken great care to see that their circuit conforms to these conditions.

The equipment to be installed is what is known as the Western Electric-Gill system, and consists of Western Electric telephone apparatus, with Gill selectors. Twenty stations along the 136 miles of line will be equipped so that the dispatcher can call them individually or collectively.

In addition to the above equipment which will be used in the regular work of handling train movements, the Norfolk and Southern will install about eight siding telephone sets at various points along the line. Two will be located at the Mackey's Ferry drawbridge in cable booths at that point, while the remainder are of a design which is arranged to be mounted on the telephone poles along the right-of-way. These sets are contained in a heavy iron weather-proof case, and are placed at important sidings along the line. The train crew can go to one of these telephone sets and talk to the dispatcher directly. This set to be installed on the Norfolk and Southern is designed especially to meet the railroad conditions.

In addition to the foregoing, one of the most important innovations of all is the use of portable telephone sets on the trains. This is one of the most prominent advantages of a telephone train-dispatching system on a railroad. It gives the road the opportunity of placing on all its trains portable telephone sets, which can be connected to the telephone line by means of a jointed fish pole. In cases of emergency, where it is of the utmost importance that the conductor get into immediate touch with the officials of the railroad and give them details as to the trouble, in order that they may know what assistance is required, the portable set has shown itself to be invaluable.

The Los Angeles Meeting

It has been decided to postpone the annual convention of the Railway Telegraph Superintendents' Association, which is to be held at Los Angeles, to June 20-25, 1910, on account of the reduced railroad rates to Los Angeles during the month of June, and in order that associate members and friends who will be required to pay their fares may take advantage of the lower rates. Headquarters are to be at the Alexandria Hotel. This arrangement will also be convenient for active members who would be unable to leave their business during May. It is believed that the attendance will be increased by the postponement.

Railway Composite Installations

By Martin J. Ryan

THE railway composite telephone and telegraph system was devised for the purpose of enabling telephone and telegraph messages to be transmitted simultaneously over grounded telegraph lines. It is adapted to simple Morse circuits where interruptions in the telegraphic current are of comparatively low frequency and where the change in potential of the current due to the operation of the telegraphic apparatus is not excessive. Except under favorable conditions, it is not suitable for use on duplex or quadruplex lines, or where machine sending is employed.

The arrangement of a grounded line telegraph system equipped with telephonic apparatus is shown in Fig. 1, which represents the general plan of a whole or part of a telegraph system thus equipped.

It will be noted that on the composited portion of a line there may be three kinds of telephone stations: terminal stations, located at each end of that part of the telegraph line used for telephonic purposes; intermediate stations, located between the terminal stations; and portable stations, intended to be carried on a train for emergency use between the terminal stations while the train is at a standstill.

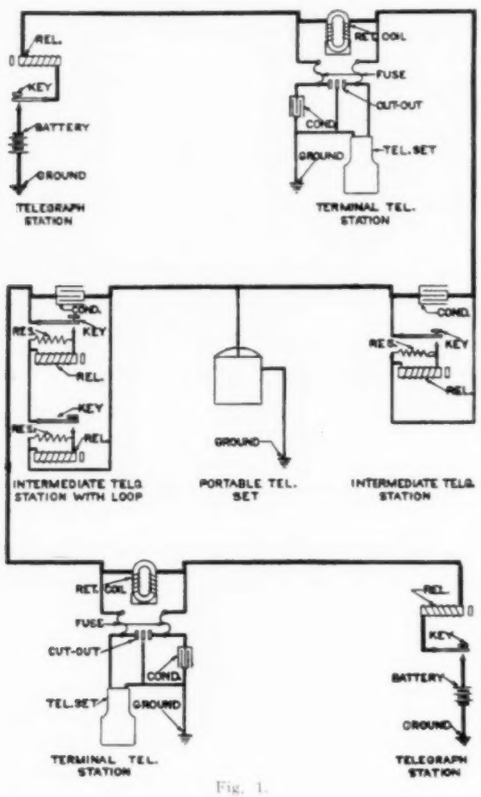


Fig. 1.

To adapt a telegraph system to telephone operation requires no change in the telegraphic apparatus or in its operation. All that is necessary is to bridge the apparatus at each telegraph station with a condenser and a resistance, and at the telephone stations to connect the telephonic apparatus between the line and ground. A condenser in each telephone set prevents the telegraphic current from passing through the apparatus to ground.

Telephone signaling is accomplished by pressing a button which places high frequency current on the line by means of an interrupter and induction coil, as shown at *C*, Fig. 2. This current at the signaled station passes through a condenser and howler to ground as at *A*, Fig. 2, causing the howler to produce a sufficiently loud sound to be readily heard in the station. The talking circuits are shown at *B*, Fig. 2. Regular local battery talking is used, and a condenser is joined in series with the receiver, which itself is shunted by a retardation coil.

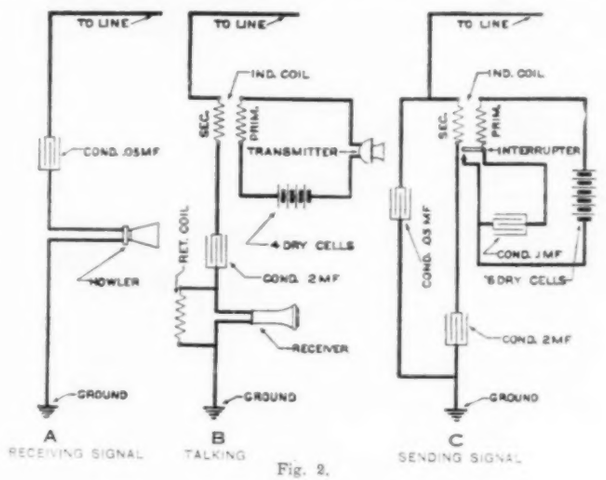


Fig. 2.

Each telegraph station on the composited portion of the line is, as already stated, provided with a condenser and a resistance coil. The former is bridged across the telegraph station apparatus outside of the peg switch, thus providing a by-path for the telephonic talking and signaling currents, which otherwise would be seriously reduced by the impedance of the relays and interrupted by the operation of the keys. The latter, a coil of high non-inductive resistance, is bridged across the telegraph relay so that when telephonic signaling current is applied to the line, any of this current flowing around the condenser will pass through the resistance and so prevent a chattering of the relay.

At each terminal telephone station is located a telephone set, a protector, a condenser, a retardation coil and a one-microfarad condenser. The retardation coil is joined in series with the line, and the condenser is bridged to ground from that portion of the telegraph line which is not composited. The retardation coil prevents the telephonic currents from passing to ground over the telegraph line beyond the telephone station, but does not impede the telegraphic currents, because these are of much lower frequency than those generated by the telephones. This coil and condenser combined prevent the impulses of the telegraphic current from producing annoying disturbances in the telephonic instru-

ments. The condenser also aids in the dissipation of any disturbing currents that may reach the telegraph lines from inductive or other causes. Batteries are installed in all the telephone stations for providing signaling and talking current.

The protective devices installed at each telephone station, not only protect the telephonic apparatus from

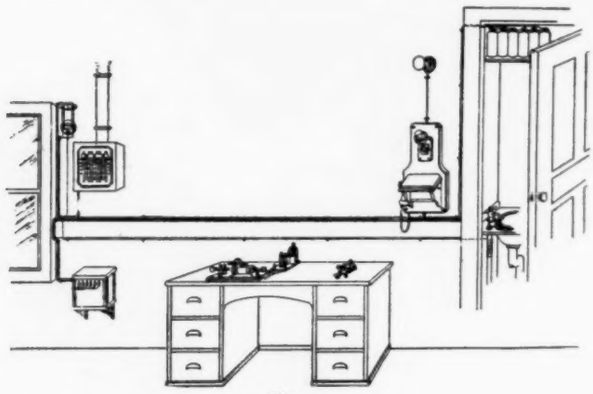


Fig. 3.

lightning and abnormal currents, but, owing to the fuses, prevent a permanent ground at the cut-outs from interfering with the telegraph service. The protector should be connected in circuit with the fuses next to the line. At intermediate telephone stations only one side of the protector is used, as there is only one wire connecting the telephone to the line.

The length of telegraph line and the number of stations with which this composite system can be successfully employed depend largely upon the character of the telegraph line. On a short line, service will be better and more stations can be operated than on a long line; the length, gauge, material of the line wire, and the amount of wire in cable are the more important features which govern the perfect operation of the system.

In arranging a line for composite service it must be remembered that iron wire is much inferior to copper wire of the same size when used for telephonic transmission, and also that conductors in cable are much less efficient than open wires. Furthermore, paper insulated wires in cables are more efficient than wires of the same size in rubber insulated cables, on account of the high electrostatic capacity of the latter.

Owing to the many different conditions governing the use of railway composite apparatus, and the variation in these conditions for each particular line, it is impossible to give inflexible rules applicable to every case regarding the length of line over which service can be successfully obtained, or regarding the number of stations which can be successfully operated on a single line. Each particular telegraph line must be considered separately before a definite statement can be made regarding its adaptability for telephone service.

As a general indication of the possibilities of the system, however, it may be stated that successful operation should be practicable over ordinary telegraph lines up to 100 miles in length, and with as many as five intermediate telegraph stations.

The apparatus must be properly installed or trouble will be experienced in the operation of the system. The small additional cost of properly installed apparatus over poorly installed apparatus is soon counterbalanced by the lower cost of maintenance.

A terminal telephone station and an intermediate telephone station properly equipped with apparatus and wired for railway composite work are shown respectively in Figs. 3 and 4.

The telephone set should be mounted so that the mouthpiece of the transmitter will be adapted to the height of the users. It should be placed where doors or movable furniture will not come in contact with it, and where it will not interfere with persons passing through the room. Damp walls and vibrating partitions should be avoided as a support for the set, and any location within two feet of a window that is liable to be opened is undesirable. For unavoidably noisy locations, telephone booths are advantageous.

The telephone set must be securely fastened to the wall. If it cannot be placed flush with the surface on account of projections, it should be blocked out from the wall with wooden strips, the strips being fastened to the wall with screws, toggle or expansion bolts, and the set afterwards screwed to the strips.

In fastening the telephone set to a brick, cement or stone wall, holes are first drilled in the wall at the proper position for the screws. Wooden plugs are then driven securely into the holes, and the telephone set screwed to these plugs. Care must be taken in plugging the holes in the wall to see that thoroughly dry wood is used, and that the plugs are large enough to hold securely. Another method consists in first fastening a board or two wooden strips to the wall, as just explained, and then screwing the telephone set to this support. As an alternative to these methods expansion bolts may be used. To mount the telephone set on a hollow tile wall, holes should be drilled through the tiles and toggle bolts used.

The howler used in connection with the wall telephone set may be located in any convenient place where its operation will attract attention. It is advisable, however, to mount it at a sufficient distance from the set so that it will not be handled by persons telephoning, and its adjustment thereby altered. The condensers should be located as near to the telegraph line or the peg switch as possible, care being taken to avoid damp locations and places where they would be exposed to mechanical injury. The resistance should be mounted at some convenient

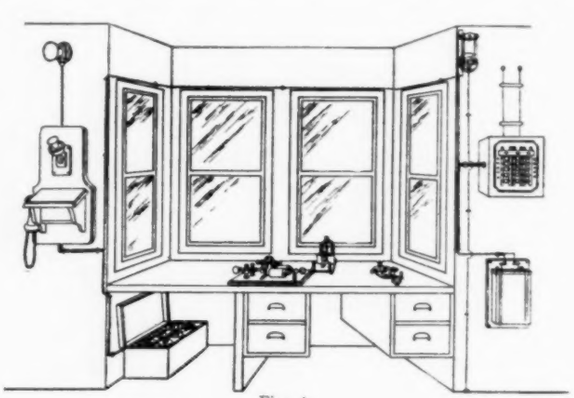


Fig. 4.

point near the telegraphic apparatus, such as beside the telegraph relay on the table, under the table, or on the wall. The protector should be mounted upon the inner wall of the building as near as possible to the point where connection is made with the telegraph line. An asbestos mat should be placed beneath it. The battery should be placed near the set in some out-of-the-way place, unex-

posed to mechanical injury and dampness, but accessible for inspection and renewals. The cells should be connected in series, that is, the carbon of one cell should be connected to the zinc of the next throughout the battery.

With the exception of the ground wire from the protector, all interior wires from the telegraph line or the peg switch to the telephonic apparatus should be of rubber covered and braided copper, not smaller than No. 19 B. & S. gauge. The ground wire from the protector should be of copper, not smaller than No. 18 B. & S. gauge, and should be rubber covered and braided; if exposed to mechanical injury, it should be of No. 14 B. & S. gauge, rubber covered and braided.

All inside wires should be installed in a neat, safe and workmanlike manner. Where it is impossible to conceal the wires, they should be run along the door or window casings against the plaster, in the molding, or in the groove at the top of the baseboard. The wires should not be run across the ceiling unless absolutely necessary, and when placed on the wall they should run either vertically or horizontally, for the sake of appearances. If it be necessary to install wires in the basement or where they are exposed to mechanical injury, care must be taken to protect them by some suitable means, such as molding or conduit. Damp localities should be avoided for all inside wires.

Where necessary to run the wires across pipes or other conducting materials, they should be protected by tubing, or by two wrappings of insulating tape for a distance of at least one inch beyond each side of the pipe or conducting material. Whenever practicable, the wires should be run above pipes rather than under them.

Where it is necessary for the telegraph or telephone wires to cross any exposed electric light or power circuits, they should be at least six inches distant from them, unless incased in porcelain tubes, circular loom or similar conduit. If the telephone or telegraph wires be thus incased, the conduit should project at least six inches on either side of the electric light or power wires and should be firmly secured with tape to prevent it from slipping out of place.

The wires should be fastened so as not to injure their insulation. Fiber cleats, insulated staples or "Milonite" nails driven between the insulated wires may be used. Each insulated staple should inclose but one wire, and care must be taken not to drive the fastener through the insulation. Uninsulated staples should not be used. Under no circumstances should coils or knots be made in any of the wires.

Splices in interior wires should always be soldered. A resin flux should be used in place of acids or paste, because of the injurious effect of the acid or paste upon the wires. After the joint is made, it should be carefully wrapped with rubber tape, the thickness of the wrapping to be at least as great as the regular insulation on the wire. When joints are made in twisted pair wire, there should be at least four inches lengthwise along the pair between the joints in the two wires.

Where a telegraph equipment is already installed in an office, the ground wire of that equipment may be used for the telephone set and protector, connection with it being usually made at the peg switch. Where no telegraph equipment is installed, it will be necessary to run a ground wire. This wire, as previously stated, should be either No. 14 or No. 18 B. & S. gauge copper wire; it should be free from spirals, coils, knots or sharp bends, and should be run as directly as possible to the ground connection which may be either a metal rod driven into permanently damp earth, or a water or gas pipe connected to the street mains which are in service.

When a ground rod is used, it must be sufficiently long to extend above the earth level, so that the ground wire can be soldered to it. When ground connections are made to pipes, the point of contact should be made as near the mains as possible, and water pipes should be chosen in preference to gas pipes. In case it is necessary to use gas pipes, the connection should be made between the meter and the street mains.

Water or gas pipes which are to serve as ground rods should be thoroughly cleaned and tinned at the part where the ground wire is to be attached, after which the wire should be wrapped tightly around the pipe and soldered to it.

If it be difficult to secure a good soldered connection, the pipe should be thoroughly cleaned and a ground clamp used; this must be securely fastened to the pipe at the cleaned portion and the ground wire attached to it.

Careful maintenance of the apparatus used for railway composite service is as important as proper installation, if good service is to be rendered. When repairs are needed, either in the apparatus or in the wiring, it is important that they be made promptly and permanently. Rush work, short cuts, skimped material, and other attempts to hasten the completion of repair work at the expense of thoroughness should be avoided. Temporary makeshifts necessitate frequent additional repairs and changes; they are a source of continual trouble, interrupted service and in the end prove very expensive.

Telephone Dispatching in the Northwest

The Great Northern Railway, which at the present time is using the telephone to dispatch its trains on divisions covering approximately 2,100 miles of its line, is now planning on a further extension of this system.

Orders have recently been placed for telephone train dispatching apparatus to be installed on six more divisions, viz.: Fergus Falls, Breckenridge, Northern, Dakota, St. Cloud and Cascade divisions, covering a total of approximately 1,900 miles. As these divisions are among the most important and busiest of the whole railway—thirteen dispatchers being required to handle the large amount of traffic—it can easily be seen that this method of train dispatching has taken a firm hold upon the Great Northern Railway officials.

The apparatus to be installed will be the Wray-Cummings selectors and Western Electric telephones, as this style of equipment has been adopted as standard by this railway, and is now in use on the present circuits. Two hundred and ninety stations will be completely equipped for the new class of service.

An interesting feature of this installation will be the placing of telephones at sidings and at stations which are not open during the whole twenty-four hours—three hundred and fifty telephones being required. While the train crews in this way can reach the dispatcher at any time, the important fact is that the dispatcher can get in touch with the train crews waiting at any siding, thus enabling him to give orders, prevent congestion and keep the traffic moving.

When the proposed equipment has been installed the telephone train dispatching system of the Great Northern Railway will extend over the entire main line from Minneapolis and Superior to Seattle and Vancouver, and, it is believed, will cover the longest continuous stretch of track of any railroad in this country.

Equipment of Southern Railway

The Southern Railway is putting into service one of the most modern equipments in this country for dispatching its trains by telephone. The division being equipped extends from Greensboro, N. C., to a little beyond Lynchburg, Va., comprising about 124 miles of road, with 36 way stations.

The equipment on the Southern road is of the latest type, employing Western Electric apparatus and Gill selectors. Not only are the trains handled by the telephone over this busy division, but the regular message work on the line, with which we have all been so familiar, and which has heretofore always been taken care of by telegraph, is now being accomplished by means of the telephone.

Besides the train wire and the message wire, two heavy copper circuits, over which they can talk even better than on the commercial long distance telephone line, the Southern road is also equipping its block wires with telephones, so that train movements from one block to the next are controlled by the tower man by word of mouth, instead of telegraphic signals.

The equipment installed is most interesting, even to those totally unfamiliar with the technicalities of telephone and telegraph work. In front of the dispatcher is a cabinet containing 36 keys, one for each way station on the line. When he wishes to call a way station he gives that particular key a twist, and as a result a mechanism is started which rings the bell of that particular station, and of no other on the line. This is accomplished by means of a piece of apparatus installed at the way stations, known as the selector, and by its use it is possible to pick out from a number of signals coming over a line the one which calls that particular station alone.

At the way stations are two small boxes, with rows of holes down their front, these holes being technically known as jacks in telephone parlance. By means of one of these boxes and the plugs which are attached to it the dispatcher can order his operators to patch around a break in the line, if such a thing happens. He can shift the telephone apparatus at that office from one circuit to another and he can make all the ordinary simple tests customary on such a line.

With the other box the operator can connect his telephone set either to the dispatcher, to the message operator, to the block north of him or south of him, or to a private line which may run to the nearest roundhouse or shops, and he can also with this little box connect the dispatcher or the message operator to any of the same points.

Furthermore, if the block towers or the round houses want to call the nearest way station or if they want to speak to the train dispatcher they can ring up the way station and display in front of that operator a little circular red target to attract his attention. This target can be connected to a bell, so that if the operator is away from his desk, he may throw the bell into circuit and get an audible signal together with the visual one.

Telephone train dispatching in an issue which at present is being extensively taken up by the railroads in the south and on many of the roads extensions to this type of service are being installed as rapidly as the equipment can be obtained. The Western Electric Company states that it is being rushed to the point of requiring more equipment to handle the railroad orders for dispatching purposes, and the universal satisfaction which has been obtained from the telephone marks most auspiciously its entrance into a brand new field.

Virginian Railway to Equip Entire System

The Virginian Railway has recently placed an order for a complete train dispatching equipment to extend over its first and second divisions. When this is installed the entire railroad will be equipped with telephone apparatus for handling train movements.

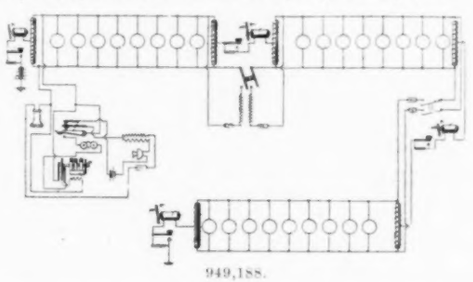
On the third division of this railroad, extending from Roanoke to Deepwater, the telephone is being installed at the present time, and it is expected that this will be cut into service very shortly.

This system on the third division employs Western Electric telephone apparatus, with Gill selectors. The equipment to be installed on the first and second divisions is of the same type, but will make use of the latest type of central energy selector. By means of this new piece of apparatus the bells at all the way stations are rung from battery supplied from the dispatcher's office over the telephone line. This represents the latest development in telephone train dispatching. The installation is being done under the supervision of G. N. MacDougald, the signal engineer of this road.

The two divisions for which equipment has recently been ordered extend from Norfolk to Roanoke, with the dispatcher located at Victoria, in the center of the line. It is approximately 250 miles in length, and the telephone circuit over this stretch will be built up of heavy copper wire weighing 210 pounds to the mile. Along this line there will be located thirty-one stations equipped with Gill selectors and twenty-seven stations equipped with telephones, but without selectors. These latter are so that the train crews can get into direct communication with the dispatcher whenever they so desire, and the selector equipment is unnecessary, because these sets are located in booths and unimportant stations along the line where there are no station agents.

Railway Telephone Patents

949,187. Train Dispatcher's Telephone Line. Each of the telephone stations has an impedance or current obstructing element in its circuit, the degree of obstruction being greater in those stations which are near the dispatcher's end of the line, and less in the distant stations, whereby all of the stations will receive an equal quantity of current from the dispatcher's transmitter and the nearer stations will not rob the more distant stations of current. Otto T. Lademan, Milwaukee, Wis., assignor to Railway Telephone & Electric Company, Chicago, Ill.



949,188.

949,188. Composite System for Train Dispatching. Several independent metallic telephone circuits arranged end to end have telephone sets bridged upon the circuits and inductance bridges for a phantom telegraph circuit; telegraph instruments are connected in the telegraph circuit between the ends of the telephone circuits, and switching means with a repeating coil are arranged to connect the telephone circuits for telephone transmission. Otto T. Lademan, Milwaukee, Wis., assignor to Railway Telephone & Electric Company, Chicago, Ill.

Why Railroads Have Adopted Telephones

By Joseph J. Graf

THE Delaware, Lackawanna and Western Railroad Company has invested over $100,000 in telephone equipment during the last one and a half years. All this equipment is devoted to train dispatching exclusively, and every foot of the system is being so dispatched today.

The question is often asked, "What benefits are obtained from the substitution of telephony—why this enormous expenditure?" and the impression appears to have been circulated that the principal reason for it was, and is, to discourage the profession of telegraphy in its possible fraternal strength.

I am sure that this impression exists only with individual members of the profession and with that portion of the public that obtains its knowledge of railroading from railroaders whose horizon of ability is gauged by the actual requirements of the position they hold; who consider their work as an unavoidable evil and look suspiciously upon all innovations that tend to increase the efficiency not only of the mechanical, but also of the human equipment of the property.

During the last decade railroad equipment has passed through a wonderful development. A car of freight today weighs as much and more than did the engine pulling a train twenty years ago. Engines today are hauling about seven times more tonnage than they did then, and are hauling it at fifty per cent more speed. In fact, speed has dictated the present structure of railway art. Its laws of nature demanded increased proportions and weight of equipment and trackage, stone ballasting to secure firmer adhesion, automatic air brakes, insuring unity of action; automatic block signals to guard against lapse of human intellect, and other devices to insure safe and prompt transit.

During all this time there was practically no improvement in the system of transmitting intelligence, without which railroads could not be operated successfully. As traffic increased the telegraph wire became congested; its capacity was almost reached at its inception. The only actual improvement made was the abandonment of the tape register. Even with the time saved by sound reading, the average speed was less than twenty-five words per minute.

The result was that trains were lying in sidings and in yards for want of orders; freight was lying idle for lack of instructions; passengers and the public in general were growling because they wanted to know, but could get no information.

All this was due to the fact that tonnage had increased far beyond the capacity, not of the dispatcher who was responsible for its prompt movement, but of the tools he had available to move it.

These tools consisted of a telegraph wire with which were connected all stations, towers and isolated telegraph offices on his division; over it each of these offices was required to report the arrival, departure and passing of all trains; over it were issued all orders and instructions governong every movement. It was used to notify trains to pick up freight at some stations and to set out cars at others or to vacate the main track to permit a following train to pass. Accidents and congestions were handled over it and a great deal more of similar detail unnecessary to enumerate. Enough has been said to convince men who appreciate the present railroad proposition that in the principal requirement of its success it was inefficient, not because of its inability, but because the requirements had reached far beyond its physical capacity.

The instrument in front of the dispatcher was always busy; the agent at one station was waiting for it to gasp for breath, so that he could tell the dispatcher that he had completed loading a car of freight. While he is waiting a train with light tonnage, and going in the proper direction, passes by; it could have picked up the car, had the dispatcher known. At another station, passengers are getting impatient because their train is late; they cannot find out how late it is because the operator cannot break in on the wire, and still at another point a train is unable to load all the people that want to board it because the dispatcher received advice of the necessity of extra equipment too late to furnish it.

The situation became so acute several years ago that the suggestion of eliminating "OS"ing all trains passing a station On Time was given serious thought by the American Railway Association, although it was acknowledged that this would affect but slight relief.

This situation affected not alone the dispatcher, but the entire organization. The officials could not keep in immediate touch with existing conditions; news and reports suffered expensive delay; the operators and agents on the line were detained in their various duties because they were standing by the instruments with their hands on the key, waiting for the opportune moment which entitled them to its possession.

The public was angry because it was not told that the train it was waiting for was ten minutes late, or had to wait an hour to learn the possible arrival time of a consignment of freight.

There was no possibility of overcoming the limited capacity of twenty-five words per minute; the shortening of divisions would have affected only local relief, therefore a substitute was looked for, and the telephone applied for the job.

Amidst ridicule, doubt and suspicion it was given a trial, and immediately proved the fallacy of claims of its unsafeness. It showed its wonderful adaptability to variable conditions. The dispatcher seemed to know by intuition that he could talk at the rate of one hundred words a minute to one man, but not so fast to another. The relief was felt almost immediately. The dispatcher found he had time to study his sheet. Instead of the operators waiting for the dispatcher, the latter was waiting for them. Trains were no longer lying in for orders, but were moving with complete knowledge of conditions ahead. The actual service time of the circuit had been reduced fifty per cent, which benefit is enjoyed by the public as well as the corporation.

I am certain that the substitution of telephone in place of telegraph will not affect the earning capacity of telegraphers. The telephone will not eliminate the necessity for the position, and the position, regardless of the profession, will demand the salary of the former telegrapher.

I have always thought that the telegraphers made the great error of assuming undue dignity for their vocation, and that their assertion that they were underpaid and held down by the employers was certainly not justified. It is simply one more illustration of the law of supply and demand; they had chosen a profession that was easily acquired, that demanded practically no sacrifice of time or expenditure of money in its study, with the natural result that the market was almost always overloaded.

Telegraphers often make the mistake of pointing to the many successful graduates of the key who are today at the helms of our largest railway organizations or captains of industry in the mercantile world, but do not exert themselves to emulate these men when they were in the profession.

Railroad Information by Telephone

C. T. Daniel, district manager of the Ozark Bell Telephone Company at Springfield, Mo., has announced an arrangement whereby the time of the arrival and departure of Frisco passenger trains is to be given by the operator in charge of the Frisco private telephone exchange, instead of by the ticket agent at the Mill street station.

The order for this arrangement comes from H. D. Teed, superintendent of telegraph for the Frisco. Heretofore, persons who wished to know the time of arrival and departure of trains have inquired of the ticket agent through the railroad company's private exchange. Under the new arrangement the telephone operator is to give this information.

The train dispatchers are to notify the telegraph operator at the passenger station whether a train will arrive on time or will come in late. The operator, in turn, notifies the telephone exchange. The information sought will be even more reliable than can be secured from the ticket agent, as special efforts are to be made to keep the telephone operator notified of any change in the arrival of passenger trains.

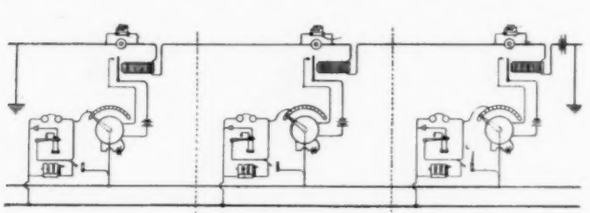
"Often it is impossible to get the ticket agent on the telephone, especially when he is busy selling tickets," said Mr. McDaniel. "He cannot answer the telephone promptly when there is a rush at the window for tickets. Under the new rule, patrons of the road will be informed without any delay. Until a set of permanent rules is issued the telephone operator will probably ask this question when a person asks for the ticket office, "Do you wish to know the time of a train arrival?" This question will be asked courteously of all persons. If a person has other business with the ticket agent he should say so and he will immediately get connection with the agent's office. I trust the public will co-operate with us in making the new arrangement a success. I am sure it will expedite matters when people want to know the time of the arrival of some trains."

Recent Telephone Patents

By David S. Hulfish

946,957. Signal System. This is a line-signal system for multiple switchboards. The object is the saving of the line and cut-off relays of the multiple board. Each of the lines is provided with answering jack and lamp, but no relays, the lamp contacts being carried to a rotary switch device, and the answering jack being of the cut-off type. When a subscriber calls, the rotary parts of the general circuit closer are set in motion and stop under control of the line to light the calling lamp at the proper answering jack. Plugging into the jack releases the device. Edward J. Burke, New York, N. Y., assignor of one-half to J. Q. A. Whittemore, Newton, Mass.

947,781. Switch and Circuit. Apparatus for alternating the polarity of current in telephone circuits for the purpose of re-



950,004.

cording the lapse of time during telephone conversations. Garrison Babcock, Rochester, N. Y., assignor to Telechronometer Company, of same place.

947,966. Attachment. Disinfectant and sanitary attachment for transmitter mouthpiece. Evan T. Evans, Westerville, Ohio.

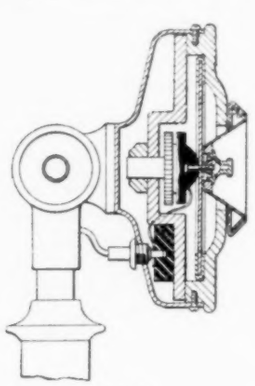
948,285. Attachment. An advertising device having changeable advertisements is changed automatically to its next position by the removal of the receiver from the hook. Elias A. Lyon, Yonkers, New York.

948,321. Insulator. Double-groove, for carrying a twisted pair. Sergius P. Grace, Pittsburg, Pa., assignor to Western Electric Company, Chicago, Ill.

948,609. Transmitter. The carbon cup is supplied with a volatile liquid. Albert H. Jahnke, San Francisco, California, assignor of one-half to Susan C. Tate, of same place.

948,941. Selective Signal Bell. The selection is made by gauging the lapse of time between an initial impulse and the ringing current. A spring motor at the substation runs during the interval and renders the bells of a line successively operative. William E. Zabst, Portage, Wis.

948,979. Line Signal Circuit. The line relay is energized



950,229.

over both wires of the line, and locks through its lamp until the call is answered. Harold D. Stroud, Chicago, Ill., assignor to Stroud International Measured Service Company, St. Louis, Mo.

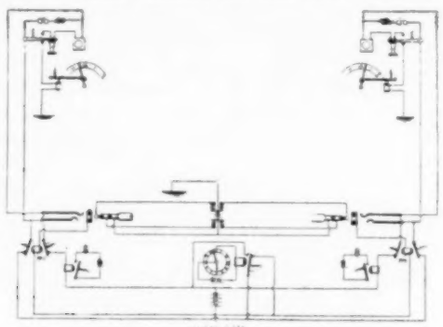
949,012. Telephone System. A busy test system in which the test is obtained by reversing the polarity of the jack bodies when the line is busy. Harry G. Webster, Chicago, Ill., assignor to Kellogg Switchboard & Supply Company, of same place.

949,159. Attachment. Device for applying sterilizers to

transmitter mouthpieces. Orrin H. Savage, New York, N. Y., assignor to Oakville Company, Waterville, Conn.

949,235. Selective System. For a private line, each station has a clock escapement controlled by an electromagnet. This system provides at each station also a magneto generator and commutator for sending impulses to control the escapement of the line. David W. Jones, Dora, Texas.

949,296. Fuse. A flexible insulating strip is formed with a narrow channel which contains the fuse wire extending between



949,296.

sheet metal terminals. Conrad J. Dorff, Chicago, Ill., assignor to Harvard Electric Company, of same place.

949,378. Selective Device. A step-by-step substation telephone set, for party-line service. Charles E. Nicholas, Columbus, Ohio, and Willard G. Rich, Rochester, N. Y., assignors to Nicholas Telephone Selector Company, Rochester, N. Y.

949,530. Party Line. A pair of line conductors extend through several stations. Each station has an electromagnetic switching device governing contacts in one of the line conductors for extending it to an additional station, the device being caused to operate upon the de-energization of the electromagnet, and an electrical restoring appliance. Arthur J. Farmer, Detroit, Mich.

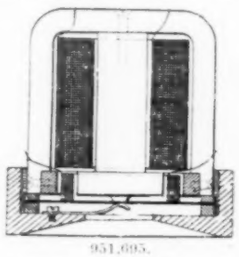
949,690. Attachment. Means for attaching telegraphone control mechanism to a telephone set. Wilbur H. Thompson, Wheeling, W. Va.

949,836. Automatic Switch. The invention pertains to means for setting the brushes of a switch in an automatic central office. A stop is adjusted, and the brush carrying member of the switch then is driven to the limit permitted by the stop. James L. McQuarrie and Edward B. Craft, New York, N. Y., assignors to Western Electric Company, Chicago, Ill.

949,881. Automatic System. The claims are specifically for combinations of fast and slow devices in the central office of an automatic exchange, and their circuits for co-operating with each other. Albert M. Bullard, New York, N. Y., assignor to Western Electric Company, Chicago, Ill.

949,952. Polarized Relay. George F. Atwood, New York, N. Y., assignor to Western Electric Company, Chicago, Ill.

950,004. Signaling Apparatus. Telephones are connected upon one circuit through selective switches, and a third wire is used with series relay at each telephone station to operate the



951,695.

selective devices. August A. Monson, North St. Paul, Minn., assignor of one-half to Frank W. Moffett, St. Paul, Minn.

950,107. Jack and Plug. In some switchboard circuits, it is disadvantageous to permit the longer springs of the jack to make contact with the tip conductor of the plug as the plug is being inserted. This invention makes the jack springs of such shape that contact is impossible, except by each jack part with its proper plug part. Alfred Larsson, Stockholm, Sweden, assignor to L. M. Ericsson Telephone Manufacturing Company, Buffalo, N. Y.

950,168. Combined Jack and Drop. A pair of slides obstruct the plug and restore the drop shutter when pushed aside by the plug. Claude D. Enochs, La Crosse, Wis., assignor to the Vote-Berger Company, of same place.

950,220. Coin Box. A device of the audible signal type, with electromagnet means for returning the last coin deposited, the returning means being operated by the subscriber and the central office operator jointly. Francis X. Bee, Philadelphia, Pa.

950,229. Transmitter. The funnel mouthpiece of the transmitter is attached to the diaphragm. Felix Gottschalk, New York, N. Y.

950,799. Receiver. A combination instrument, combining induction coil and receiver. David H. Wilson, Chicago, Ill., assignor to George W. Kretzinger, of same place.

950,809. Desk Stand. A removable hook lever, and removable sections of the vertical column to expose the switch, are the principal features of novelty. Burton W. Sweet, Cleveland, Ohio, assignor to Harry Z. Sands, of same place.

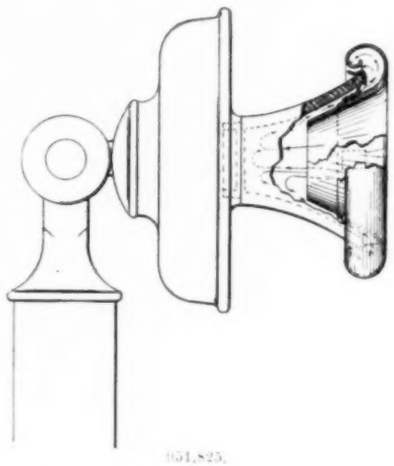
950,865. Attachment. A muffler for transmitter mouthpiece. William D. Plumb, New York, N. Y.

950,896. Clock Circuit. Synchronizing current for clocks at telephone substations is applied through the cut-off relays and the hook switches of the lines when the lines are not connected nor calling. Application filed October 11, 1900. W. W. Dean, Chicago, Ill., assignor to Consolidated Fire Alarm Company, New York, N. Y.

950,937. Attachment. A disinfectant apparatus closes the mouthpiece except when the receiver is off the hook. Arthur W. Lyda, Newcastle, Pa., and Elmer C. Robinson, Lowellville, Ohio.

951,129. Terminal. The cable terminal is made in sections, and as many lines may be provided for as required. Frank G. Jones, Muskegon, Mich.

951,147. Conductor. In a paper core cable the conductor



951,825.

number is stamped upon the paper wrapper of the conductor at frequent intervals, rendering the conductor identifiable without test. Albert B. Porter, Chicago, Ill., assignor of one-half to McMeen & Miller, of same place.

951,319. Support. A support for desk stand telephone. The support is designed to grip about the vertical column of the telephone set. Robert Krum and Harry Weingartner, Lawrence, Kan.

951,527. Selective Set. A magneto set with step-by-step selecting device for rendering the magneto equipment operative or inoperative as required. Ruben C. M. Hastings and Thurston Matheny, Athens, Ohio.

951,558. System. A system of telephony for intercommunicating common battery or house systems. Samuel H. Couch, Boston, Mass.

951,623. Relay. A pair of relays compactly mounted. Alton E. Stevens, Fall River, Mass., assignor to International Electric Company, of same place.

951,695. Receiver. The line coil of the receiver is attached directly to the diaphragm. An electromagnetic field is shown. Pedro M. Oliver, Barcelona, Spain.

951,825. Attachment. An auxiliary mouthpiece or mouthpiece guard provides a path for circulation of air through the transmitter mouthpiece. Bert C. Maxwell, Canton, Ohio.

951,844. Attachment. An antiseptic cone is inserted into the transmitter mouthpiece or is removed therefrom by a movement of the hook lever. Lucien Rosenwald, Kansas City, Mo., and John H. R. Anthony, Kansas City, Kan., Anthony assignor to Rosenwald.

Of Interest to the Trade

Advance in the Art of Soldering

While there have been many noticeable improvements along various lines in the telephone and telegraph fields, little or nothing has been done to improve on the old methods of soldering. The same method used years ago is still the common one. This consists of first carefully cleaning the joint, then applying the acid or rosin as a flux, and finally, after the joint is soldered, carefully neutralizing the acid to avoid after action. To do this satisfactorily the service of a skilled workman is required, and more of his time is used up than is justifiable.

The demand for improvement has been met in Germany and is being met in this country by the introduction of "Tinol," a new solder, in paste form. This solder is composed of finely granulated lead and tin, each particle of which is covered with an oily, absolutely non-acid flux; five standard proportions range from 100 per cent tin down to 20 per cent tin and 80 per cent lead; special mixtures are also furnished.

The advantage of using solder in paste form can readily be appreciated. The work of soldering is rendered so simple and easy that any one can do it. All that is necessary is to smear on the requisite quantity of paste with a brush, a spatula, or even the fingers, and apply the heat in any convenient form. A little practice will teach just how much of the paste to apply, and thus droppings, which always mean waste and often cause trouble in the way of short circuits, are avoided. No special cleaning, as by scraping or dipping, is required; if the joint looks clean to the eye, that is sufficient. The work of neutralizing the acid is also avoided, as the Tinol's self-contained flux is absolutely free from acid. Tinol is a great time saver, and a boy with little or no experience can do the work as well, and in less time than a skilled workman using the ordinary solder. In all kinds of telegraph and telephone instrument work where it is desirable to get neat, clean joints, this material is especially recommended, since it leaves no greasy joints; on the other hand, wiping with a dry or greasy cloth will give a clear, polished surface. Joints, in difficult positions, which could hardly be made with ordinary solder, are easily made with Tinol.

For convenience in some cases, Tinol is furnished in rod and wire form, ranging in diameter from 5/32 inch down to 1/32 inch; the same flux used with the granulated tin and lead to make the paste is used as a core in the rod and wire form.

In conclusion, a report of a test made by the German government, which owns and operates its telegraph and telephone lines and builds and maintains the apparatus, etc., and which has adopted Tinol, might be of interest. By the usual method, using ordinary solder, the three joints made in an underground cable sleeve, 4½ inches in diameter and 14 inches long, averaged an hour, and between six and eight pounds of solder were used, including the melting pot waste. With Tinol the average quantity of solder used per sleeve was reduced to 2½ ounces, and the average time of each joint to 21 minutes. As regards the strength, out of a total of twenty sleeves tested at 50 pounds pressure, all of the Tinol joints were sound, while with ordinary solder imperfections were found in three out of every ten. Joint, on being sawed open, showed that all interstices were completely filled. Resistance tests showed fully as high a conductivity at the joints as elsewhere.

The decided improvement in the economy, neatness, convenience and quality of work done with Tinol on other line work, as well as interior work on switchboards and instruments, has secured its adoption here also. Pound for pound, Tinol costs considerably more than ordinary solder, but, joint for joint, the total cost is lower.

Tinol is being marketed by Hess and Son, Philadelphia.

Western Electric New Mine Telephones

The prevention of loss of life from fires in mines has become imperative. The most practical safeguarding measure that has been advanced by authorities on the subject is a systematic use of the telephone. The usefulness of telephones in mines is by no means a new subject for discussion. Many mines already have working telephone systems both above and below ground, and it facilitates their business as well as provides a means of safety in case of accident.

The accompanying illustrations show two new designs of mine telephones recently completed by the Western Electric Company. The work of bringing this new type of apparatus into its final form has been under way during the past eighteen months, although the development and reconstruction has covered a period of several years of close co-operation with mine operators and officials, with the idea of making the new design cover all the requirements of mining service.

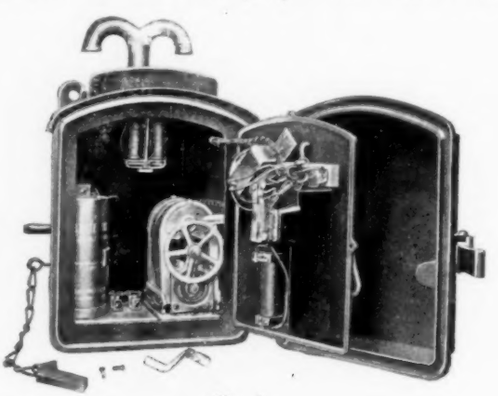


Fig. 1.

The illustrations in Figures 1, 2 and 3 show three views of what is known as No. 336-E metal type mining set. Fig. 4 shows No. 337-E, a specially treated wooden type set, having the same general features of operation and arrangement of parts as the apparatus of the metal sets. Both types of telephone sets are very compact and attractively designed. All of the apparatus inside of the cases is arranged for accessibility and at the same time carefully protected against corrosion due to acid fumes, gases and moisture.

All of the parts which for any reason need to be removed can be easily taken out of the sets without the aid of a soldering iron, as all the connections are made with suitable screws. Although it is not neces-

sary to get into the working parts of the apparatus except for changes to the system this feature makes the system available for inspection at any time.

The top of the metal set is curved, and the wooden set is provided with a gable roof, so that any foreign articles or water falling on either of them will readily slip or run off.

The line wires to the sets may be brought in either at the top of the box or at the bottom. When brought in at the top the curved connector shown at the top of the box in Fig. 1 is used. This connector, it will be noted, prevents moisture or water from

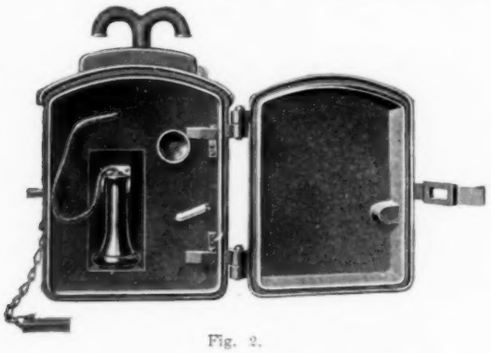


Fig. 2.

running into the set when the wires are led into the top of it. It will be readily seen that as the wires come down to the set and make the turn into the curved connector any moisture or water will drop from this point and not follow the wire into the apparatus.

When the line wires are brought in from the bottom, it is not necessary to use the curved connector and the opening for it at the top of the set is closed by a suitable plug provided for the purpose.

The gongs are especially designed to give a loud, clear ring which can be heard a long distance in the

Fig. 3.

mines. As seen in the illustrations these gongs are protected by a hood, making it impossible for large particles of foreign matter to fall on them or interfere with their action.

The sets are equipped with a highly efficient five-magnet generator. The transmitters and receivers are of the standard "Bell" grade, which are so well known in this country and abroad. All the windings of the receivers, ringers, induction coils and generators are specially treated so as to protect them from the action of acid fumes, gases and moisture.

The Western Electric Company announces that it has ready for general distribution bulletin No. 1,110, describing these new types of telephone and signal apparatus for mines. The bulletin takes up the development of the Western Electric mine telephones and describes completely features of construction and operation of its two new types of sets—No. 336-E, a metal set, and No. 337-E, a wood set.

For use in the superintendent's office and in those protected parts of mining plants the No. 1,317 type Western Electric telephone set is shown.

The mine signal sets treated in the bulletin consist of a 5-bar magneto generator for signaling used with either of two types of bells for receiving signals. One type of bell is equipped with 8-inch gongs and one with 6-inch gongs, the former being protected with a wooden canopy.

The design of these signal sets is such that they are especially adapted to mining service, and their

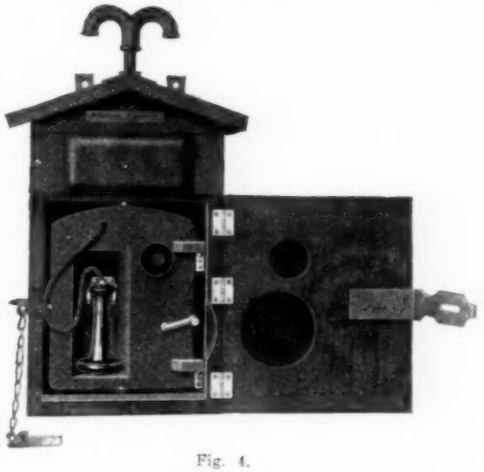


Fig. 4.

construction and arrangement are such that any adjustments when necessary can be made easily and quickly.

The bulletin consists of twelve eight inch by ten inch pages, with twelve half-tone illustrations of the sets and apparatus. Copy of the bulletin will be sent upon request to the nearest Western Electric house.

Kellogg Bulletins

Plain facts—what most people want to know about—are sometimes the hardest to find in trade literature. The average catalogue is an array of glowing statements on what the apparatus will or may do under the most favorable conditions. The "reasons why" are often neglected. There is often too much theory and too little plain discussion of practical points in the work—the kind of questions the "man with the telephone" has to ask about.

Further to bring out the fact that Kellogg telephone bulletins are practical, especially with reference to magneto telephone work, the Kellogg company is issuing a return postal folder entitled "We Can Show You."

The operators' difficulties with "rubbering in," signaling central secretly, etc., are mentioned in the postal as being fully explained, with many other features of modern telephone practice, in the Kellogg bulletins, which are sent promptly on request.

The educational features of the Kellogg party line

bulletin No. 30, written by H. N. Faris, Kansas City branch sales manager, a thoroughly practical telephone man, are well known and appreciated by both novice and veteran in the business. The demand for this bulletin has necessitated a second edition, which is now going to press.

The Kellogg company is issuing a return postal card calendar illustrating a subscriber telephoning over one of its desk stands. The half-tone brings out clearly the symmetrical lines of the Kellogg telephone and seems to indicate that telephoning over Kellogg apparatus is a pleasure, a fact that operators generally know to be true.

The calendar is being sent out with a return card attached, which allows the recipient conveniently to send for desk stand prices or bulletins on telephones and switchboards. The illustration is made in two colors and shows a pretty girl talking over a desk telephone held in her hand. Below the half-tone plate is a line drawing of a rural scene, a telephone pole line stretching away in the distance, past a prosperous looking farmhouse. This postal calendar will be sent promptly by addressing the company.

Lorimer-Lundquist Automatic Claims

For some time, as has been known, there has been a contest in the patent office over the fundamental patents on the automatic telephone. This contest, which covers several years, involves the Strowger interests on one side, a patent issue to Frank Lundquist on a second side, and an application for patent by Lorimer. The Lundquist invention was owned by the Globe Automatic Telephone Company, which some years ago installed many small exchanges, principally in the western states, while the Lorimer interests, which have installed a number of automatic exchanges in Canada and some in foreign countries, were owned partly by American and partly by Canadian capitalists. Recently the Globe and Lorimer interests have combined, forming the Lorimer-Lundquist Company, organized in Maine with a capital stock of $1,750,000 and with James D. Lynch, of Chicago, as president.

On the 19th of April, 1910, the Lorimer-Lundquist Company brought suit in the circuit court against the Automatic Electric Company for $1,500,000, alleging infringement of the Lundquist patent No. 747,197. This is a different patent from that over which the contest in the patent office has been waged, and the bringing in of this patent raises a question as to how far priority and the right of ownership may extend. As a large number of automatic exchanges have been installed and are now in operation, the outcome of this suit will be watched with keen interest.

The above patent represents a system operated in Pawnee City, Nebraska, in 1898, and is claimed to be the first system which arranged switches in groups and used a percentage of secondary switches for each group. The primary or subscribers' switches are now called selectors and the second switches are called connectors. The patent relates principally to this percentage and grouping organization, and to certain arrangements for preventing interfering connections, and it is the validity of the patent in regard to these matters which is to be determined by the suit. Experts say that all modern automatic systems are constructed on this plan. During 1905 notice was given the public through advertisements stating that this and another patents were being infringed by users.

Patent No. 776,524, also owned by the Lorimer-Lundquist Company, and issued December 6, 1904, covers the trunking system. In 1906 the Strowger Company set up a counter claim in the patent office, and the contest which is entitled Keith, *et al.*, vs. Lundquist vs. Lorimer, *et al.*, has been waged ever since, testimony having been taken in ten cities, including four in Europe.

The Keith interest is owned by the Automatic Electric Company while the Lundquist and Lorimer interests, as before stated, have been consolidated to form the Lorimer-Lundquist Company.

A Wood-Preserver "Genealogical Tree."

In the article entitled "Construction versus Destruction," by Harry H. Gerhard, which appears on another page, appears an extremely interesting chart showing the findings of an investigator in the field of wood-preserving oils. The C-A-Wood-Preserver Company will be pleased to forward a copy about four times as large as this to any one desiring it. It should be in the hands of every pole user.

Among those who have applied the "C-A-Wood-Preserver" to poles before setting them and who have used the brush method with successful results are: Home Telephone Company, Henderson, N. C.; Jellico Light, Heat and Power Company, Jellico, Tenn.; Freeport (Ill.) Light and Railway Company; Colorado Springs (Colo.) Electric Company; Newnan (Ga.) Water and Light Commission; Montgomery (Ala.) Water, Light and Power Company, and many others. One of the largest corporations in the United States made a series of investigations on superficial treatment with all preservatives and has purchased within less than a year over 30,000 gallons of "C-A-Wood-Preserver."

The C-A-Wood-Preserver Company has its headquarters at Austin, Texas; manufactures its product in Germany; imports it through New York, New Orleans and Galveston; makes shipments from New York, New Orleans, St. Louis, Salt Lake City, Denver and Galveston. Branch offices are maintained at 275 La Salle street, Chicago; 863 Camp street, New Orleans, and 201 Felt building, Salt Lake City. Harry H. Gerhard is manager; William H. Gerhard, assistant manager; Herman F. Gerhard, superintendent of treating department, and Dr. E. P. Scnoch, chemist. The company claims to be the only superficial treatment concern which is a member of the Wood Preservers' Association of the United States.

New Book from Matthews

We have just received from W. N. Matthews & Brother a copy of the second edition of their telephone line construction book. Many of our readers will remember the very complete construction book which these people issued in the spring of 1908. The second edition has been revised down to date and contains sixteen more pages.

The following are some of the features covered that were not in the first edition: A new and more economical method of erecting telephone poles. Seven pages on a new device for the exact location of shorts, rounds and crosses on telephone cables. Ten pages which comprehensively describe the use and advantages of a bridle ring for interior block distribution of telephone wires, a system now coming into great favor with the larger Bell

and independent companies. Much more data on the stringing of telephone wires, formulas and tables, showing the amount of sag to allow for given temperatures. The appendix contains seventy-four pages of engineering data, which show in complete detail all the necessary steps for the erection of an up-to-date overhead telephone system. This book will be mailed by the publisher to any telephone company who will write for it on its business letterhead and have the letter signed by an officer of the company; or it will be sent to any individual postpaid on receipt of fifty cents. It will be well worth the while of any person interested in telephone business to obtain one of these books.

New P. B. X. and Other Bulletins

The Western Electric Company has recently issued bulletin No. 1005, which is the third of a series of nine bulletins on telephone exchange apparatus which is to be issued. This bulletin is entitled "Branch Exchange Switchboards of Lamp Signal and Magnetic Signal Types." It describes the types of branch exchange equipments which have been designed for use in business establishments, factories, schools and places where a modern private telephone system is required.

The material contained in the bulletin is divided into sections, each section treating some particular part of the branch exchange equipment, such as lamp signal, line circuit apparatus, cord circuits, ringing circuit apparatus, trunk circuit apparatus, etc.

The back part of the bulletin is given to illustrations of the different types of switchboards. This bulletin contains 32 pages, 8 by 10 inches. A copy will be sent to any reader upon request to the nearest Western Electric house.

The company has also recently issued its bulletin No. 5360, which takes up the subject of Hawthorn small power motors. The bulletin describes very completely types of small motors, both alternating and direct current, ranging from 1-6 to 1-30 horsepower, suitable for various purposes, such as buffing and grinding wheels, sewing machines, meat grinders and other household machines which require little power to operate.

The direct current motors are built for operation on 110 and 220 volts at various speeds from 1100 to 3400 revolutions per minute.

All of these types may be had with either shunt, series or compound windings.

The alternating current small motors are built for 110 and 220 volts at 60, 45 and 25 cycles, single two and three-phase, at the several synchronous speeds, in a full line of fractional horsepower ratings ranging up to one-quarter horsepower.

In Emergency

The following letter is typical of a number received by the Kellogg Switchboard and Supply Company in the last four months, in acknowledgment of rush orders effectively filled:

Gentlemen—I wish to thank you for your promptness in taking care of our recent telegraphic orders for telephones to replace those recently destroyed by fire.—HOME TELEPHONE COMPANY, JOHN H. WRIGHT, Manager.

Last week the Kellogg company received two additional orders for rush switchboard equipment and filled them in record time. This makes at least a dozen of such orders successfully filled in the last four months by the company.

The Great Falls Automatic Telephone Company, Great Falls, Montana, ordered for its Cascade exchange one one-hundred line switchboard and fifty-five telephones. This order was received March 14 and was shipped complete March 15.

Another order of interest, because it shows promptness and efficiency in handling orders, is the request by telegraph of the Athens Telephone Company, Athens, Texas, for one four-hundred-fifty-line switchboard. This was received March 24 and was shipped complete March 30.

Scranton Molded Insulation

The Scranton Button Company of Scranton, Pa., manufacturer of molded electric insulators, receiver shells, mouthpieces and molded telephone appliances, is gaining entrance to the hearts of the telephone trade through the high-grade and finished product it manufactures. Scranton electroid material is a non-absorbent high insulator, taking a bright polish and giving long life. The company claims the largest plant in the world devoted to molding telephone appliances, and with its thirty years' experience and up-to-date equipment, is in a position to manufacture product suited to the needs of the telephone field.

Mr. H. E. Cobb, the company's western sales agent, offices at 1530 Monadnock block, covers all territory west of the Ohio River, and with the numerous samples and printed matter at his office will be very glad to assist all buyers looking for a suitable substitute for the common insulating materials. Write him or the factory for the company's new 1910 catalogue.

A New Telephone Mouthpiece

The ordinary composition or hard rubber mouthpiece is easily broken and a source of considerable expense to a company in the course of a year.

The ordinary steel mouthpiece removes this objection, but it is dangerous, as it is a ready conductor of electricity and a source of danger during storms or through crossed wires. The common metal mouthpiece is affected by dampness and corrodes easily.

Taking these things into consideration, the Kellogg Switchboard and Supply Company has combined the advantages and eliminated the objections of the two styles, in the design of a new reinforced rubber-covered steel mouthpiece.

This mouthpiece has a perforated steel shell covered with a coating of hard rubber molded over it at great pressure and heat. As the rubber is forced through the perforations and around the shell, it makes an absolutely unbreakable mouthpiece.

The threaded portion is made directly on the steel at the base, eliminating danger of breakage at a point where most rubber and composition mouthpieces give way.

A report has been received from an American diplomatic officer in a Latin-American country, forwarding a copy of a decree granted by the local government to a business man for the construction of an international bridge and telephone and telegraph lines. Copy of the decree, giving full particulars, can be obtained by addressing the bureau of manufactures, File No. 4700, or TELEPHONE ENGINEER.

New American Electric Fuse Catalogue

The American Electric Fuse Company's bulletin No. 300 has recently been mailed to the trade, and has been very kindly received, due to the convenient manner in which it has been arranged. It is in loose-leaf form, for the convenience of jobbers and others who may wish to arrange it in a different manner, and to accommodate insertions of future matter or tables of interest to the user. It is printed in large, readable type, on extra heavy enameled paper, and treats with great clearness its well-known lines of fuses, arresters, protectors, cable terminals and distributing frames. It is profusely illustrated with cuts of uniform size, and the various articles are properly classified under their separate headings. In as far as possible, all wood cuts and zinc etchings have been suplanted by retouched halftone engravings. From the personal word of President F. G. Jones to the rear cover, this new telephone catalogue is worthy of attention.

New Stromberg-Carlson Pamphlets

Stromberg-Carlson Telephone Manufacturing Company has issued its pamphlet No. 29, treating common battery telephones in all of its many styles. This bulletin, with suitable cuts, explains the usages and advantages of portable desk, hotel type, wall convertible ringer type, residence type and combination telephones. The Stromberg company has also issued another of its instructive bulletins, named "How to Build a Rural Telephone Line." The instructions given in this book recommend only what is considered good construction and will be a great aid to any one needing condensed matter of this kind. In addition to the usual cuts of construction materials, they show several circuits illustrating common sense and time and material-saving methods.

Sterling Pole Bulletin

W. C. Sterling and Son Company of Monroe, Mich., has issued a new bulletin, exploiting poles of sterling quality, and showing view of its Monroe, Bay City and Cass City yards. The company's thirty years of experience is very aptly illustrated in a comparison of the present pole years with the enormous stock of cedar poles and ties, as compared with a view of the yard in 1880. "A Little Michigan Cedar Pole History," coupled with government reports, very clearly shows the lasting qualities of cedar poles. The bulletin closes with inspection comments and the latest reviewing of standard specifications of white cedar products.

Announcement is made that the Electric Storage Battery Company has acquired all the patents and rights of the Westinghouse Storage Battery Company. The Westinghouse Storage Battery Company owned all the rights of the General Storage Battery Company, and the storage battery interests and patents of the Westinghouse Machine Company. The Electric Storage Battery Company will now have the sole right to manufacture Westinghouse batteries.

Brevities of the Business

PERSONAL NOTES.

Six years ago Frank W. Pardee was chosen as general manager for Frank B. Cook. Before that, Mr. Pardee was introducing to the telephone trade a piece of apparatus known as the Adjustaphone, manufactured by the Chicago Writing Machine Company. He had demonstrated his ability as a salesman before Cook found him. He proved his fitness for bigger things during his three years with the big protector manufacturer, and when the time came to "go it alone," Mr. Cook's employes gave Pardee one of those joy-partings that comes to a man all too seldom. Incidentally they gave him a beautiful watch, all engraved—something he is carrying yet, because he couldn't pawn it if he wanted to! After resigning from Cook, he embarked in business on his own account. Every telephone man knows the success he has achieved with the Durant Electric Supplies Company; with Ironite; and with himself. He is retaining all of these interests, but they have been turned over to others who will manage them. Mr. Pardee is now the general manager of the L. M. Ericsson Telephone Manufacturing Company, Buffalo, N. Y. He goes into the management of this big concern with his mind free from the cares of his own business. Telephone Engineer has abundant confidence in Mr. Pardee's ability to make a success of his present occupation. Skoal!

H. M. Shaw has resigned his position with the Bell Telephone Company of Pittsburg to become superintendent of telegraph for the Gilmore & Pittsburg Railroad of Idaho.

Louis H. Anderson, Fort Worth, Texas, formerly connected with the Isthmian Canal Company in the capacity of engineer, has been appointed general superintendent of the Ecuador Long Distance Telephone Company of Ecuador.

Owing to the pressure of other duties, P. Kerr Higgins has given up his work as editor of the *Monthly Bulletin* issued by the Pioneer Telephone & Telegraph Company, Oklahoma City, Okla.

C. E. Stratton, Trinidad, Colo., has assumed the position of district manager of the Colorado Telephone Company, Colorado Springs, succeeding R. F. Morris, who takes a position with the company at Denver.

J. F. Middleton has been appointed manager of the Home Telephone Company, Portland, Ore.

R. C. Blakslee, formerly connected with the Juneau Electric Telephone Company, Juneau, Wis., has taken a position in the telephone train dispatching department of the Milwaukee railroad at Savanna, Ill.

Nathaniel Thayer has resigned from the directorate of the American Telephone & Telegraph Company, and Eugene V. R. Thayer has been elected to fill the vacancy.

Carl Juvenal, only child of C. D. Juvenal, superintendent and general manager of the American Automatic Telephone Company, Urbana, Ohio, died recently of pneumonia at Crawfordsville, Ind., where he had been assisting in installing an automatic system for the Home Telephone Company. Young Juvenal was graduated last June from Wittenberg college in Ohio and was preparing to make telephone engineering his life work.

Thomas Reem, auditor and acting secretary of the Inter-State Telephone Company of Aurora has tendered his regination, to take place as soon as his successor is appointed. Mr. Reem's resignation follows closely that of J. F. Harral, general manager and treasurer of the company.

Charles S. Gleed was recently elected president of the Bell Telephone Company of Missouri-Kansas Telephone Company, which has headquarters in Kansas City. At the same time F. L. Gilman was elected general manager of both companies and will have executive offices in both St. Louis and Kansas City.

J. Milme has been appointed manager of the Monroe County Telephone Company, Sparta, Wis.

C. H. Judson, known throughout the country as a highly

successful telephone engineer, who has had wide experience in the construction and operation of large telephone plants, has resigned his position as chief engineer of the Independent Telephone Company of Seattle, Wash. It is understood that Mr. Judson will take a much needed rest before engaging in business again.

Casper Olstad has been appointed district manager of the Rocky Mountain Bell Telephone Company, with headquarters at Casper, Wyo.

A. E. Gieriet has been appointed manager of the Northwestern Telephone Company, Jamestown, N. D.

CONVENTIONS.

The annual convention of the Missouri Independent Telephone Association will be held at the Metropole Hotel, St. Joseph, Mo., May 3, 4 and 5.

The Michigan and Indiana Independent Telephone Associations will hold a joint annual convention in South Bend May 11 and 12; headquarters at the Oliver Hotel Annex.

NEW TELEPHONE COMPANIES.

WEBB'S CROSS ROADS, KY.—The Thornton & Savor Telephone Company has just been organized here by H. J. Thomas, W. T. Thornton and J. O. White, with capital stock of $500, who will build and maintain a local independent telephone line from Webb's Cross Roads, Ky., to Savor, Adair county, Ky., a distance of 25 miles. Construction material will be needed. Address H. J. Thomas, manager, Thornton & Savor Telephone Company, Webb's Cross Roads, Ky.

WILLIAMSBURG, KY.—The Whitley County Home Telephone Company, here, are securing rights-of-way and franchises for the construction of a local independent telephone line from Williamsburg, via Faubush and Corbin to London, Ky., 31 miles, and the construction work will be begun at once. Material will be needed. Address James V. Begley, manager, Whitley County Telephone Company, Williamsburg, Ky.

CONFLUENCE, KY.—The Confluence Local Telephone Company has just been organized here by Albert Q. Sizemore and others for the purpose of building and maintaining a local telephone system in Confluence. A switchboard will be needed. Their capital stock is $500. Construction material will be needed. Address Albert Q. Sizemore, manager, Confluence Local Telephone Company, Confluence, Ky.

HAZARD, KY.—The Perry County Home Telephone Company announces an increase in their capital stock from $3,500 to $4,000, with franchises to build new lines from Hazard, Ky., via Buckhorn and Sassafras to Wooten, Ky., 30 miles, and from Hazard, via Grapevine, to Bath, Ky., 24 miles. The necessary material for the construction will be needed. Address D. V. Combs, manager, Perry County Home Telephone Company, Hazard, Ky.

PIKEVILLE, KY.—The Eastern Kentucky Home Telephone Company, here, announces that they will shortly begin the construction of two or more short lines in Dickinson county, Virginia, to connect with their local and long distance lines in the Big Sandy river section. Construction material will be needed. Address N. Starkey, manager, Eastern Kentucky Home Telephone Company, Pikeville, Ky.

HALL, KY.—The Cline Telephone Company has been organized here for the purpose of building a local independent telephone line from Hall, via Puncheon and Lower Beaver Creek, to Harold, Ky., 25 miles, connecting with long distance lines at Harold. Rights-of-way have been secured. The capital stock is $1,000. Address B. F. Cline, manager, the Cline Telephone Company, Hall, Ky.

SERGENT, KY.—The Letcher County Home Telephone Company, here, is making the announcement that they are shortly to construct a local independent telephone line from Sergent, via Pound, Dewey, Lipps and Guests River, Va., to Norton, Va., 25 miles, where long distance connection is to be made with the Tennessee & Virginia Telephone Company. Construction material will be needed. Address Letcher County Home Telephone Company, Sergent, Ky.

SPRINGFIELD, KY.—The Cecil Telephone Company, just organized and incorporated here by S. M. Cecil, B. J. Cecil and W. J. White, with capital of $1,000. They will build a system in Springfield, with some country connections around Springfield. Construction material will be needed. Address W. J. Smith, manager, the Cecil Telephone Company, Springfield, Ky.

HILIARD, KY.—James P. Hartt and others contemplate building a telephone exchange at Hiliard and will need the material necessary for its construction. Address, for further, information, James P. Hartt, Hiliard, Ky.

CISNEY, KY.—The Rosewood Telephone & Telegraph Company has just been organized and incorporated here by E. Thorngerg, W. J. Jenkins, J. H. Smith and others, with capital of $2,000. Objects and purposes to build and maintain a local independent telephone business in and around Cisney. One line will be constructed from Cisney, via Hemphill, to Oliver, Ky., where an important connection will be made. Address the Rosewood Telephone & Telegraph Company, Cisney, Ky.

CLARKSON, KY.—The Hickory Valley Telephone Company has just been organized here by A. O. Burns, Jesse Whitten, R. B. Horrell and others, with capital of $1,000, R. B. Horrell being manager. They will install a telephone system in Clarkson and build local independent line from Clarkson to Dycusburg, 13 miles. Construction material will be needed. Address R. B. Horrell, manager, the Hickory Valley Telephone Company, Clarkson, Ky.

GRADYVILLE, KY.—The Gradyville Home Telephone Company just organized here by Jasper Wiston, S. G. French and W. K. Elliott, with a capital of $1,000, fully paid in. Will build and maintain a local independent telephone system in Gradyville; besides will build one main line from Gradyville to Stanford and Somerset. Construction material will be needed. Address Gradyville Home Telephone Company, Gradyville, Ky.

JEREMIAH, KY.—The Lower Rockhouse Telephone Company, here, announces some extensions for this year. One, and the most important, will be a local independent line from Jeremiah, via Gourd, Ky., to Upper Line Fork, where connections will be made with the Harlan Telephone Company's line, giving long distance connection. Material will be needed. Address J. M. Brown, manager, Lower Rockhouse Telephone Company, Jeremiah, Ky.

VIPER, KY.—William Combs and others here are making plans for the building of a telephone system in Viper. Their plans will be made known within a few days, when bids for the construction material will be asked for. Address William Combs, Viper, Ky.

PINEVILLE, KY.—The Bell-Jelico Telephone Company has been organized in this city by W. F. Smith, Kelly Green and others for the purpose of building a local independent telephone line from this city to Jelico, 31 miles. Their capital is $2,000. Construction material will be needed. The Bell-Jellico Telephone Company, Pineville, Ky.

WHITESBURG, KY.—It is stated here, reliably so, that N. Starkey of the Eastern Kentucky Home Telephone Company, Pikeville, Ky., will build a system in Whitesburg during the year, in order to give long distance connections to points on the Big Sandy river. Material will be needed, including switchboard and other fixtures. Address N. Starkey, Whitesburg, Ky.

COLLY, KY.—John S. Webb and others of Colly will build a system in Colly and construct a local independent line from Colly, via Thornton, to Lester, Ky. Material will be needed. Address John S. Webb, Colly, Ky.

WHITESBURG, KY.—The Whitesburg Telephone Company will purchase a switchboard for their Whitesburg exchange, besides other equipment to improve their system. New lines will also be built. Construction material will be needed. Address James P. Lewis, manager, Whitesburg Telephone Company, Whitesburg, Ky.

HARLAN, KY.—The Harlan Home Telephone Company, recently organized here, will, it is announced, build a long distance line from Harlan, via Middlesboro and Wasioto, Ky., to Pineville, Ky., 42 miles, the construction of same to be begun by May 15. Local lines will also be built in and around Harlan during the summer months. Construction material will be needed. Address he Harlan Home Telephone Company, Harlan, Ky.

HALL, KY.—The Caney Fork Telephone Company has been organized here by Lindsey King, John S. Franklin and others for the purpose of building a local independent telephone line from Hall, via Puncheon, to Caney Fork, 15 miles. Capital stock, $1,000. Construction material will be needed. Address John S. Franklin, manager, the Caney Fork Telephone Company, Hall, Ky.

ROBERTSDALE, ALA.—The Alabama Telephone & Telegraph Company has been incorporated with the following officers: President, Ellis L. Mumma; secretary and treasurer, Spaulding Peck.

SCRANTON, ARK.—A telephone company has been organized in this place with a capital stock of $4,000 and the officers are as follows: President, Bert Chitwood, Prairie View; secretary, C. E. Hays of this place.

SAN FRANCISCO, CAL.—The Northern Telephone & Telegraph Company has been incorporated with a capital stock of $100,000, of which $16,000 has already been subscribed, and it is the purpose of the company to operate in Plumas and Lassen counties.

The incorporators are: Scott Hendricks, William E. Hills, Arthur Matthews, Grant Smith, William E. Colby and J. O. McElroy of this city, and W. H. Bissell of Livermore.

DALTON, GA.—M. C. Kennemer, J. S. Griffin, C. A. Griffin and others have made application for a charter for the Mill Creek Telephone Company.

CHICAGO, ILL.—Articles of incorporation have been filed for the Subway Telephone Construction Company with a capital stock of $100,000, which has for its purpose the manufacture and sale of electrical appliances and machinery. The incorporators are Joseph Harris, Sanford F. Harris and Albert E. Wilson.

LATHAM, ILL.—The Latham Telephone Company has been incorporated with a capital stock of $10,000 by J. W. Collins, Bekmeyer, J. S. Haller and P. E. Kohl.

SANDPOINT, IDAHO.—The Bonner County Rural Telephone Company has been incorporated with a capital stock of $7,500 and the officers are as follows: President, Wallace McCurton; vice-president, Geo. Minckler; secretary-treasurer, F. M. Molyneaux.

SPRINGFIELD, GA.—Articles of incorporation have been filed with the secretary of state for the Effingham Telephone & Telegraph Company, with a capital stock of $5,000. Among those interested are the following: Sidney O. Newson, Guyton; C. F. Berry, J. B. Simmons and E. W. Griffin of this city and L. D. Kessler of Blanford, Ga.

LINTON, IND.—David R. Scott, George P. Chapman, Thomas E. Harris, Likens Littell and Warren Tintsman are the directors of the Linton Mutual Telephone Company, recently incorporated with a capital stock of $10,000, for the purpose of operating throughout Greene, Clay, Owen, Monroe, Knox, Sullivan and Vigo counties.

BRAZIL, IND.—The Jackson Township Telephone Company has been incorporated with a capital stock of $10,000 by George Young, Ralph Blissler and Charles W. Evans of this place and Willis McCullough and John Hoffman of Center Point.

ELLIOTT, IOWA.—The Elliott Mutual Telephone Company has been incorporated by H. E. Leonard and O. J. Powell; capital stock, $20,000.

BELMOND, IOWA.—Articles of incorporation have been filed by the Belmond Telephone Company; capital stock, $20,000. The incorporators are as follows: E. N. Hinman, J. P. Ott, J. S. Pritchard, Ole Thompson, T. A. Davenport and others.

OWENSBORO, KY.—The Owensboro Telephone & Telegraph Company has been incorporated with a capital stock of $250,000 by J. D. Powers and Samuel M. Heller of Louisville.

PADUCAH, KY.—Articles of incorporation have been filed for the Paducah Home Telephone & Telegraph Company by I. E. Kniseley and R. D. Crane; capital stock, $10,000.

WINTHROP, ME.—The Boston & Maine Land & Lumber Company, which has for one of its purposes the operation of telephone and telegraph lines, has been incorporated by E. M. Leavitt and others, with a capital stock of $500,000.

DIXFIELD, ME.—Articles of incorporation have been granted the Oxford Farmers' Co-operative Telephone Company, which has been incorporated with a capital stock of $9,900, and the officers are as follows: President, Daniel W. Berry; treasurer, Philetus W. Torrey.

HARMONY, ME.—The Harmony & Wellington Telephone Company has been incorporated. The capital stock is $5,000 and the incorporators are: A. H. Wills, president; S. W. Herrick, treasurer, and others.

PORTLAND, ME.—E. A. Turner is president of the Union Gas & Electric Company, which has just been incorporated with a capital stock of $10,000, and which has for one of its objects the operation of telephone lines.

PORTLAND, ME.—The Cacamuya Mines Company is the name of a new organization incorporated with a capital stock of $100,000, which, in connection with its other purposes, will also conduct a telephone business. A. F. Dunham is president and M. S. Wells, treasurer.

BROWN CITY, MICH.—The Brown City Telephone Company is the name of a new organization recently chartered by the secretary of state, with a capital stock of $10,000. The incorporators are Geo. W. Dafoe, Walter H. Witt and Ora A. Tuck.

ELKTON, MICH.—The Huron Telephone Company has been incorporated with a capital stock of $8,000 by Albert Fitchell and William Asher.

DETROIT, MINN.—The Detroit Telephone Company has been incorporated with a capitalization of $50,000. W. B. Carman is secretary of the company.

ROLLINGSTONE, MINN.—Articles of incorporation have been filed for the Mt. Vernon Farmers' Telephone Company. The capital stock is $15,000 and the incorporators are Fred Frey, Peter Kreidermacher of this place and Wm. Markwardt of Altura.

NEVIS, MINN.—The Nevis Telephone Company has been incorporated with the following officers: President, Swan Rodin; vice-president, Peter Kavanaugh; secretary, F. L. Culver; treasurer, J. H. Halvorson. The capital stock is $10,000.

MOTLEY, MINN.—The Motley Telephone Company has been incorporated with the following officers: President, V. Lockwood; vice-president, C. E. Seely; secretary and treasurer, S. W. Jacobs.

GENTILLY, MINN.—The Gentilly & Huot Telephone Company has been incorporated. The capital stock is $10,000 and the officers are as follows: President, Patrick Kelly; vice-president, Joel J. Suave; secretary and treasurer, Jos. Dufault.

MILES CITY, MONT.—Articles of incorporation of the Miles City Automatic Telephone Company have been filed with the secretary of state by H. H. Hauson and others of Butte; capital stock, $300,000.

BUTTE, MONT.—Articles of incorporation have been filed with the secretary of state for the State Telegraph & Telephone Company of Butte. The company, which is to have a main exchange in the heart of the city, is incorporated in almost every county in the state and it expects to spread and co-operate with other companies throughout Montana and surrounding states. It is incorporated for the purpose of constructing and maintaining telephone, telegraph and wireless systems. The incorporators are John Steadman, Wilford Tetheway, Irving Whitehouse, J. F. Taylor and M. B. McKay, all of Butte. The life of the company will be forty years under the present articles of incorporation and the capital stock is $500,000.

TROY, MONT.—The Lincoln County Telephone Company is the name of a new organization recently incorporated by F. B. Callow and N. W. Morrison.

LIBBY, MONT.—The Libby Telephone Company has been incorporated. The incorporators are Paul D. Pratt, C. P. Garing and H. E. Brink and the capital stock is $5,000.

WILLOW CREEK, MONT.—The Willow Creek Telephone Company is the name of a new telephone company which was recently incorporated by William A. Flaharty, John Walbert, Jr., and R. W. Harwood with a capital stock of $20,000.

DAVENPORT, NEBR.—The Davenport & Kiowa Telephone Company has been incorporated by W. S. Sanner, C. L. Padgett and Geo. Beam; capital stock, $15,000.

LONG PINE, NEBR.—The Long Pine & Southern Telephone Company has been incorporated with a capital stock of $10,000 by B. F. Buell, H. B. Sampson and W. A. Sheldon.

HAMILTON, N. Y.—Articles of incorporation have been filed for the Hamilton Telephone Company of this place. The capital stock is $10,000 and the incorporators are W. S. Hawkins, Waterville; H. H. Hawkins, Mabel I. Hawkins, Emma L. Sanford and A. G. Sanford, Hamilton.

GARRISON, N. Y.—A charter has been granted the Farmers' Rural Telephone Company with a capital stock of $25,000. The directors of the company are Chas. W. Hodge, Fritz Giffey, Wm. M. McElwain, N. W. Gehles and Henry Steffens. It is the purpose to install a system in this place which shall extend to surrounding territory.

ELLENDALE, N. D.—The Ellendale Telephone Company with a capitalization of $15,000 has been incorporated by D. W. Coleman and A. W. McDonald.

BAILEY, N. D.—A charter has been granted the Como Telephone Company. The capital stock of the company is $25,000 and the incorporators are Matej Koc and E. Sivertsen, Bailey; Paul Blaseg and O. R. Hamill, Valley View; J. S. Miller, Ames.

CALIO, N. D.—Articles of incorporation have been filed for the Trierm Rural Telephone Company with a capital stock of $15,000.

MYLO, N. D.—The Mylo Farmers' Telephone Company is the name of a new organization incorporated with a capital stock of $5,000 by J. P. Dunigan, Munich; J. G. Mundy, H. E. Hendrickson, Carl Strietzel, G. S. Lewis of Mylo, and others.

SHERWOOD, N. D.—The Barber Mutual Telephone Company has been incorporated by M. J. Burns, president; John H. Kuger, of Sherwood, and John Servold and John J. Wherley of Tolley, N. D.

COLUMBUS, OHIO.—The International Telephone Company of Columbus has been incorporated by E. C. Woodworth and John C. Hewett of Athens and E. E. Learned, F. W. Brinker and Katherine Learned of Columbus. The new company will engage in the manufacture of telephone equipment and supplies and will have several special, patented articles which have been tested quite thoroughly for some time. The capital stock of the company is $300,000 and its plant will be located in this city. The stock is divided into 8,000 shares of preferred stock of $25 par value and 4,000 shares of common stock of $25 par value.

ARCHER'S FORK, OHIO.—The Corby-Cady Telephone Com-

pany has been incorporated with a capital stock of $10,000 by John Taylor and others.

HUDSON, OHIO.—The Hudson Telephone Company is the name of the new organization which has been incorporated by Clifford A. Neff, W. S. Lester, W. C. Rhodes, F. A. White and M. A. Meisel for the purpose of taking over the local telephone system. The capital stock is $30,000.

TIPPECANOE, OHIO.—Articles of incorporation have been filed for the Tippecanoe Telephone Company by Samuel R. Fergus, Ellis H. Kerr, Chas. O. Davis, Chas. E. Ernrick and A. R. Garver. The capital stock is $35,000.

SALISBURY, N. C.—The Independent Telephone Company has been incorporated with a capital stock of $50,000.

OMEGA, OKLA.—The Mutual Telephone Company has been incorporated with a capital stock of $5,000 by Benjamin F. Smith, W. T. Morts, J. C. Smith and John E. Wood.

YELTON, OKLA.—Articles of incorporation have been filed for the Ditch Valley Telephone Company with a capital stock of $25,000. The incorporators are Jacob Wolf, Englewood, Kan., and others.

BORING, ORE.—The Boring Mutual Telephone Company has been incorporated by J. W. Roots, O. W. Boring, A. G. Knox, all of Boring; capital stock, $5,000.

FORWARD, PA.—The Elizabeth Rural Telephone Company has been incorporated by J. W. McKinney, James Christy, Frank Hayden, W. P. Caldwell and Sidney McConnell, all of Forward.

OWANKA, S. D.—The Homestead Telephone Company has been incorporated by Jos. W. Waterson, W. J. Calling and W. L. Rifenburg; capital stock, $5,000.

BELLE FOURCHE, S. D.—Articles of incorporation have been filed for the Belle Fourche and Northern Telephone Company with a capital stock of $60,000. The incorporators are J. W. Smith, W. L. Barbour, A. T. Moore, Joseph Scott and Della Scott, all of this place.

DALHART, TEXAS.—The Dalhart Telephone Company has been incorporated with a capital stock of $15,000 by C. S. Morris and W. W. Moore, to take over the stock of the Morris Telephone Company in Dollam and adjoining counties.

MALVERN HILL, VA.—The Henrico-Charles City Telephone Company has been incorporated; capital stock, $5,000.

HOLLIDAY'S COVE, W. VA.—The Turkey Telephone Company has been incorporated by W. Morrow, J. Morrow, F. G. Watson and others; capital stock, $5,000.

PRINCETON, WIS.—The Princeton Telephone Company has been incorporated by H. J. Maxwell, Geo. T. Keeley and A. A. Kreuger; capital stock, $5,000.

DENVER, COLO.—The Antero Telephone Company has been incorporated by D. B. Annis, B. W. Jones and S. M. Blackman of Denver; capital stock $10,000.

SYLVANIA, OHIO.—A charter has been granted the People's Telephone Company of this place. The capital stock is $10,000 and the incorporators are: S. L. Wallace, Ralph Brown, John C. Jones, C. H. Maher and C. D. Calvin.

ROLL, OKLA.—A new company, to be known as the Roll Telephone Company, has filed articles of incorporation with the secretary of state. The incorporators are: J. E. McKinney, D. W. Snider and Perry Madden; capital stock, $1,000.

HOYT, OKLA.—The Hoyt Telephone Company has been incorporated by B. M. Gates, T. A. Ponder, of Hoyt; J. A. Hill, and J. T. Killebrew, Enterprise; S. J. Barton, Brooken. The capital stock is placed at $2,000.

MESSER, OKLA.—The Choctaw County Rural Telephone Company is the name of a new organization incorporated with a capital stock of $1,000 by C. G. Messer, W. W. Westbrook and J. D. Henderson, all of Messer.

WALTER, OKLA.—The Big Pasture Mutual Telephone Company has been incorporated to operate in Comanche county. The capital stock is $2,500, and the incorporators are: H. O. Miller, Walter; T. E. Lewis and S. A. Jones, Ahpeatone.

SCHOOLTON, OKLA.—A charter has been granted the Farmers' Schoolton Telephone Company granting the right to construct and operate a telephone system in Seminole county. The capital stock is placed at $1,000, and the officers are: President, J. H. Herrel; vice-president, R. M. Gunn; secretary, C. W. Cargile; treasurer, Dr. J. B. Bright.

WEST BUTTEVILLE, OREGON.—Articles of incorporation were filed recently by the Tri-County Telephone Company, the capital stock being $400 The incorporators are: Will E. Purdy, Arthur Cone, John Smith and F. W. St. Clair.

ASTORIA, OREGON.—County Assessor Cornelius and two Washington county men are organizing an independent telephone company, with a capital stock of $100,000, the object of which is to construct and operate telephone lines from this city to various sections of Clatsop county. The company plans to acquire the existing farmers' lines in the Lewis and Clarke and Young's river districts and to extend the latter to the Nehalem valley and thence to a connection with the Washington and Columbia county lines.

SHAWNEE, OKLA.—The Shawnee Home Telephone Company has been incorporated with a capital stock of $5,000. The directors are: W. S. Kiser, B. L. Sadler, Frank J. Austin, Frank Shorney, B. S. Pine and Fred Springer.

GLIDE, OREGON.—Articles of incorporation have been filed for the Glide and Peel Rural Telephone Company with a capital stock of $500. The incorporators are: John Alexander, H. A. Blakely, and L. Lilly.

RIVERSIDE, OREGON.—The Riverside Rural Telephone Company has been incorporated, with principal office in this place. The capital stock is $1,500, and the incorporators are: S. M. French, W. G. Thomas, and Charles Johnson.

INDEPENDENCE, OREGON.—The Home Telephone Company has been incorporated by J. S. Bohannon, J. L. Hanna and W. L. Rice; capital stock, $14,600.

SUBLIMITY, OREGON.—The Sublimity Telephone Company has been organized by Ira B. Carter, J. E. Kimsey and E. G. Denny. Capital stock, $1,000.

FOUNTAIN SPRINGS, PA.—A new organization to be known as the Fountain Springs Telephone Company has been formed with the following officers: President, C. Alex. Seitzinger; treasurer, Thos. Richards. The company is capitalized at $5,000.

PENNHALL, PA.—W. P. Hosterman, Percival Tharp, Frank Fisher, and W. A. Neese, of Spring Mills, have incorporated the Pennhall Rural Telephone Company with a capital stock of $1,500. H. B. Hering, Spring Mills, is treasurer of the company.

PAXINOS, R. F. D. No. 7, PA.—Tobias Dunkelberger, of this place, is treasurer of the Irish Valley and Seven Points Telephone Company, recently organized with a capital stock of $5,000, of which one-half has been paid in.

ELDRED, PA.—The Farmers' Equitable Telephone Company has been organized, and the officers are: President, W. H. Lanphier; secretary, J. E. Wright; treasurer, E. J. Wright.

LEMMON, S. D.—The Perkins County Telephone Company has been incorporated by O. S. Quammon and others. The company is capitalized at $10,000.

DALLAS, S. D.—Articles of incorporation have been filed for the Western Telephone Company by Ernest A. Jackson, Graydon B. Jackson and A. F. West. The capital stock is $25,000.

DE SMET, S. D.—J. L. Van Hook, O. U. Ahlers, John Hendricks, Jos. Cronkhite, F. H. Poppen, F. S. Meyers and R. J. Armstrong have incorporated the Spirit Lake Telephone Company. The capital stock of the company is $10,000.

MCINTOSH, S. D.—The Corson County Telephone Company has been incorporated by E. J. Cook, J. E. Davis and J. A. Archambault; capital stock, $25,000.

CLARK, S. D.—The Day Township Telephone Company is the name of a new company just incorporated by J. H. Beatty, F. E. Cochrane and L. B. Cradit with a capitalization of $5,000.

BADGER, S. D.—The Badger Mutual Telephone Company has been incorporated by F. M. Wolf, P. O. Nelson, and O. J. Oleson, Hetland; C. P. Swift, Badger; C. S. Kirkland, Norden. The capital stock is $20,000. It is the purpose of the company to construct lines throughout Kingsbury county.

DRAPER, S. D.—The State Telephone Company is the name of a new organization incorporated at this place by Charles Parker, J. C. Russell and others, with a capital stock of $5,000.

BELLE FOURCHE, S. D.—The Belle Fourche and the Northern Telephone Company has been incorporated with a capital stock of $60,000. The incorporators are: J. W. Smith, W. L. Barbour, A. T. Moore, Joseph Scott and D. Scott.

SALEM, S. D.—The Sun Prairie Telephone Company has been incorporated by August Brinker, J. B. Schmidt and J. W. Greenough.

CANTON, N. C.—The Canton Electric and Telephone Company has been granted a charter. The incorporators are: G. H. Henson, J. N. Mease and R. H. Sorrells and a theorized capital stock is $100,000.

WILLETTE, TENN.—Articles of incorporation have been filed for the Willette Home Telephone Company by D. E. Morris, C. L. Wakefield, C. M. Shoulders and S. C. Sutton.

FLORESVILLE, TEX.—The Floresville Telephone Company is the name of a new concern incorporated with a capital

stock of $6,000 by John W. Wood, W. A. Scott, S. K. Franklin and others.

Franklin, Tex.—The Franklin Telephone Exchange has been incorporated; capital stock, $5,000. The incorporators are: R. W. Cole, F. S. Eastes and others.

Austin, Tex.—Articles have been filed for the incorporation of the United Telephone Company, of Austin, with a capital stock of $300,000. The incorporators are: I. B. Cameron and H. M. Daugherty, of Columbus, Ohio; James S. Brailey, of Toledo, Ohio; W. D. Hart and G. W. Allen, of Austin.

Centerville, Wash.—The Centerville Telephone Company has been organized by Theodore Jackal and Henry Yeackel; capital stock, $5,000.

Menasha, Wis.—The West Menasha Telephone Company has been organized, and the following are the officers: President, John Tofler; secretary and treasurer, William Grimes; directors, Henry Smith, Fred Schroeder, Reuben Thompson.

Chetek, Wis.—The Citizens' Telephone Company has been organized at this place for the purpose of purchasing the present system and installing a modern exchange. The capital stock is $5,000.

New Richmond, Wis.—The St. Croix Telephone Company is a new organization which has recently been incorporated by John J. Padden, Andrew Tobin and L. A. Baker, with a capital stock of $25,000.

Greenville, Wis.—The South Greenville Farmers' Telephone Company has filed articles of incorporation. The company has a capital stock of $7,200, and the incorporators are: Louis Pingle, J. H. Schneider and Albert Mass. The company is to be a clearing house for all the independent telephone companies up and down the St. Croix valley.

Loyal, Wis.—The Clark County Telephone Company is the name of a new company recently chartered. A. W. Hales, M. F. Doyle and C. H. Brown are the incorporators, and the capital stock is placed at $4,000.

Williamsburg, Kas.—A new home telephone company was recently organized in this place by the citizens of this place and farmers of the adjoining country. It is the purpose of the company to install a new system. Among those interested are: W. K. Greene, Homewood; Patrick McLinden, Williamsburg; Jasper Davis, Williamsburg; Ira Huddleston, Homewood; William Martin, Princeton; John H. Reader, Melvern R. F. D. 3; Ambrose McGee, Quenemo, R. F. D. 3.

Denver, Colo.—The Tri-State Telephone and Telegraph Company has filed articles of incorporation with the secretary of state. The company is incorporated for $1,000,000, and the incorporators are: E. B. Field and others. The Colorado Telephone Company, under its charter, is authorized to do business only in Colorado and New Mexico, but the Tri-State will have the right to enter New Mexico, Texas and Arizona. The work of construction will be started within six months, and it is the purpose to connect Denver with all the tributary territory in southern New Mexico, western Arizona and northwest Texas.

RATES.

Hastings, Nebr.—The railroad commission has granted the request of the Hastings Independent Telephone Company to increase its rates from $2.50 to $3 for business telephones; 15 per cent discount if paid before the tenth of the month; from $1.50 to $1.75 for residence telephones, with 10 per cent discount; from $1.25 to $1.50 for farm telephones, with 10 per cent discount.

Albion, Iowa.—The Albion Telephone Company has been granted permission by the State Railway Commission to increase its rates from $2 to $2.25 on business telephones; $1.50 to $2 on two-party business; $1 to $1.50 on residence and $1 to $1.25 on two-party residence.

Tulsa, Okla.—An attempt is being made to increase the rates of the Pioneer Telephone & Telegraph Company to $2.50 for residence telephones and $4 for business.

Cuthbert, Ga.—The Corn Belt Telephone Company will petition the railroad commission for the right to increase its rates at this place.

Ely, Nev.—The White Pine Telephone Company has increased its rates for residence telephones.

Rushville, Nebr.—The railway commission has ordered the Rushville Telephone Company to charge the following schedule of rates, beginning May 1: Business telephones, $1.50 per month; residence telephones, $1; 25 cents per month discount to such subscribers as furnish their own telephone instruments; switching farm line telephones, $5 per year.

FINANCIAL ITEMS.

Freeport, Ill.—The capital stock of the Freeport Telephone Company has been increased to $50,000 for the purpose of making extensions and improvements, including the installation of a new switchboard and the changing from a magneto to common battery system.

Warrensburg, Ill.—The Warrensburg Telephone Company has doubled its capital stock, having increased it from $5,000 to $10,000.

South Bend, Ind.—The Long Distance Telephone Manufacturing Company has changed its capital stock of $100,000 common to $50,000 common and $50,000 preferred.

Graysville, Ind.—The Turnam Township Telephone Company has increased its capital stock from $2,250 to $3,750 for the purpose of making extensions and improvements.

Des Moines, Iowa.—The stockholders of the Iowa Telephone Company, at their annual meeting, authorized increase of the capital stock from $4,000,000 to $10,000,000, the purpose of the increase being to provide for retiring the bonded and other indebtedness, and to provide additional capital for increasing the business. The following officers were elected: President, C. E. Yost; vice-president and general manager, G. E. McFarland; secretary and treasurer, James B. Mason.

Alma, Mich.—At the annual meeting of the stockholders of the Union Telephone Company it was voted to increase the capital stock from $750,000 to $1,000,000.

Onaway, Mich.—The capital stock of the Onaway Telephone Company has been increased from $50,000 to $100,000.

Lincoln, Nebr.—The Lincoln Telephone & Telegraph Company has asked permission to issue $355,800 worth of stock, $77,000 to take up short notes; $50,000 for the construction of new long distance, and $50,000 for improvements in this city.

Clinton, Ohio.—The capital stock of the Clinton Telephone Company has been increased from $125,000 to $200,000.

Bellefontaine, Ohio.—The United Telephone Company has increased its capital stock from $300,000 to $400,000.

Columbia, Pa.—The Columbia Telephone Company's capital stock has been increased from $75,000 to $100,000 for the purpose of making improvements and extensions.

Meyersdale, Pa.—An amendment has been filed increasing the capital stock of the Economy Telephone Company from $30,000 to $50,000.

Cleveland, Texas.—The Cleveland Telephone Company has filed an amendment increasing its capital stock from $2,000 to $15,000.

Spokane, Wash.—The Washington Southern Telephone Company, organized about a year ago with a capital stock of $100,000, has increased its capital stock to $600,000.

Wellsburg, W. Va.—The Wellsburg Home Telephone Company has filed an amendment increasing its capital stock from $50,000 to $75,000.

Ellington, Wis.—The Ellington Farmers' Telephone Company has increased its capital stock from $2,000 to $8,000.

Loyal, Wis.—The capital stock of the Beaver Telephone Company has been increased from $400 to $800.

FRANCHISES ASKED AND GRANTED.

Juliaetta, Idaho.—A 50-year franchise has been granted the Fox Ridge & Juliaetta Co-operative Telephone Company.

Toluca, Ill.—Frank Shipley has been granted a franchise by the city council to maintain and operate telephone exchange.

Lafayette, Ind.—The Indiana Union Telephone & Telegraph Company has petitioned the board of public works for a 25-year franchise for a long distance telephone line into this city.

Peabody, Kans.—The Home Telephone & Telegraph Company has been granted a franchise to construct and operate a telephone system in Peabody.

Libby, Mont.—At a special election a franchise to construct and maintain a telephone system was granted the Libby Telephone Company.

Ashland, Ohio.—The Star Telephone Company has been granted a new franchise by the city council.

Tulsa, Okla.—Citizens of this place, headed by Cicero L. Holland, have filed an application with the city auditor asking for a franchise to construct and operate a telephone line at rates not to exceed $1.50 for residence and $2 for business telephones.

Clinto, Texas.—The county commissioners have granted a franchise to the Clint Telephone Company and the company will at once begin the construction of lines connecting the farms, ranches and towns of the lower valley with El Paso.

MEDICAL LAKE, WASH.—The Medical Lake Telephone Company, through its representative, James Glasgow, has been granted permission to construct telephone lines along certain roads of the county.

FLORENCE, NEBR.—At a special meeting of the city council the fourth extension of the original two-year franchise to the Independent Telephone Company was granted. The new franchise contemplates the completion of the new plant now being installed within six months. When actual operation of the system begins a franchise for a term of twenty-five years will be granted. The installation of the plant will incur an expenditure of $10,000.

OTTAWA, KANS.—The executive committee of the commercial club has approved the outline of a proceeding by the Home Telephone Company for a new franchise in Ottawa as a basis for the complete rebuilding of its local plant. A draft of the franchise will be prepared at once and submitted for consideration. It is estimated that $75,000 will be spent in rebuilding the plant.

COLVILLE, WASH.—The Kettle Falls Telephone and Electric Company has been granted a ten-year franchise to operate a telephone system in Colville.

PAOLA, KAS.—The Paola Telephone Company has been granted a franchise.

SULLIVAN, IND.—The Merchants' Local Telephone Company, which was recently organized as a result of the Sullivan Telephone Company increasing its rates, has been granted a franchise by the city council, and it declares its purpose to build a competing system.

QUINCY, MICH.—The Algansee Central Telephone Company has been granted a thirty-year franchise to construct and operate a telephone system in this place.

CLITHERALL, MINN.—Julius Severson, of this place, has been granted a twenty-year exclusive franchise for the construction and operation of a telephone system.

MILES CITY, MONT.—The Montana Independent Telephone Company, of Butte, Mont., has been granted permission to construct and maintain a telephone system in this place.

SALISBURY, N. C.—The Rowan County Commissioners have granted franchises to the Gold Hill Telephone Company, Gold Hill, and the Ebenezer Telephone Company, for the construction and main operation of telephone systems.

FARMINGTON, UTAH.—The Davis County Independent Telephone Company has been granted a franchise to construct and maintain a telephone system in Ogden, Utah.

RITZVILLE, WASH.—D. V. Cushman, assistant general manager of the Washington Southern Telephone Company, Spokane, Wash., has been granted a franchise to install a new telephone system in this place.

CHENEY, WASH.—L. A. Bratt, representing the Pine View Telephone Company, has applied to the county commissioners for a franchise to construct a telephone line along the country roads, beginning at Cheney.

PRESCOTT, WIS.—The Prescott Telephone Company, through its representatives, Geo. S. Hollister and G. E. Hollister, has been granted a franchise to construct and maintain a telephone system in this place.

MISCELLANEOUS.

GREELEY, COLO.—The Northern Colorado Telephone Company will run a cable to Lucerne which will cost $4,000 per mile. The company will spend $135,000 in this vicinity.

NEW HAVEN, CONN.—At the annual meeting of the New England Telephone Company it was announced that in October of this year $1,099,100 additional capital stock will be issued which will bring the total capital stock up to $88,792,809. The company now has 75,584 telephones in this state, an increase during the year of 7,575. The net revenue of the company for the year was $546,402. The amount of dividends paid was $461,622. The earnings amounted to $2,473,347 and the expenditures to $1,926,944. John W. Alling was re-elected president of the company.

SPRINGFIELD, ILL.—The Interstate Telephone Company has petitioned the city council for permission to place its wires under ground on Fourth street.

OLNEY, ILL.—The telephone exchange at this place has been purchased by the Southeastern Illinois Long Distance Telephone Company of Robinson, Ill., for a consideration of $13,000. The new company contemplates many improvements.

CLINTON, ILL.—The National Telephone and Electric Company, B. F. Wasson, president, is making arrangements to install an up-to-date system in this city.

EUREKA, ILL.—The telephone exchange at this place has been purchased by George M. Meyers, Washington; Dr. Gordon, El Paso; Peter Sommers, Metamora; Oscar Shepard, Washburn; M. E. Wheelwright, Roanoke, and W. Bullock, Eureka.

GALESBURG, ILL.—The Galesburg Union Telephone Company will construct a copper metallic line to Macomb and one to Rock Island.

GALESBURG, ILL.—The Galesburg Union Telephone Company contemplates important extensions and improvements including copper metallic lines to Macomb and Rock Island, and the reconstruction of the system at Knoxville. The switchboard capacity will probably have to be enlarged to meet the demands of its increasing business.

AURELIA, IOWA.—The Northern Telephone Company's exchange at this place has been purchased by the Co-operative Telephone Company.

LINTON, IND.—The Linton Telephone Company's exchange was recently destroyed by fire.

SOUTH BEND, IND.—To relieve the congested condition of telephone service between Mishawaka and this city the Home Telephone Company will lay underground trunk lines between the two cities, besides making other improvements.

KENDALLVILLE, IND.—The Home Telephone Company will install a new common battery system and make many other improvements in its service.

NEW MARKET, IND.—The New Market Telephone Company will construct a new telephone exchange and install a new switchboard which will be followed by a general reconstruction of the system.

VALPARAISO, IND.—On the account of the increasing demand for service the Northern Indiana Telephone Company finds that it will have to enlarge its equipment and the company contemplates the erection of a new exchange building which shall be large enough to meet all future requirements.

LONDON, KY.—The London Local Rural Telephone Company has been purchased by John W. Creech.

BOWLING GREEN, KY.—The Bowling Green Home Telephone Company is making important extensions in Butler county, including the installation of a system at Logansport, Ky.

SERGENT, KY.—The Letcher County Home Telephone Company contemplates the installation of an exchange at Millstone.

HILLIARD, KY.—James P. Hart and others of this place will install a local telephone system and also construct a line to Whitesburg.

SASSAFRAS, KY.—J. B. Hall and others are interested in the promotion of a local telephone system.

LOUISVILLE, KY.—J. D. Powers has been appointed special commissioner of the Paducah Home Telephone Company, Paducah, and the Kentucky-Indiana Telephone and Telegraph Company of Owensboro, both of which have been ordered sold by Judge Evans of the Federal court.

READING, MICH.—The exchange at North Adams has been acquired by J. F. Fitzsimmons, president of the Reading Central Telephone Company, thus adding 407 telephones to the Reading system.

MT. CLEMENS, MICH.—The Macomb County Telephone Company will install an exchange in this place.

PINE RIVER, MINN.—The Pine River Rural Telephone Company will construct additional lines during the coming season.

MUSKEGON, MICH.—The Citizens' Telephone Company has agreed to install an automatic exchange in this city.

BOONEVILLE, MISS.—The Booneville Telephone Company of this place and the Guntown Telephone Company, Guntown, are planning the reconstruction of their system during the coming season.

ST. LOUIS, MO.—The Kinloch Telephone Company is planning a number of extensions.

TUCUMCARI, N. M.—The Tucumcari Telephone Company and the Panhandle Telephone and Telegraph Company of Amarillo, Texas, will construct a line connecting the two cities.

TRENTON, N. J.—Papers have been filed with the secretary of state merging the Delaware and Atlantic Telephone and Telegraph Company of Nw York and the Delaware and Atlantic Telephone Company of New York into the Delaware and Atlantic Telephone and Telegraph Company, and the Northeastern Telegraph and Telephone Company, the Hudson River Company and the Seashore Telephone Company were merged into the New York Telephone and Telegraph Company.

OSCEOLA, MO.—The Osceola Telephone Company is planning numerous improvements in its system, including a partial renewal of its central office equipment.

RAVENA, N. Y.—An effort is being made to merge the Ravena and Medway Telephone Company with the State Telephone Company of Ravena, recently incorporated, and if successful many improvements and extensions will be made which will involve the expenditure of a considerable sum of money.

MEDINA, N. Y.—The Continental Telephone and Telegraph Company which has acquired a controlling interest in the Medina Home Telephone Company, will make extensive improvements in the system.

COLUMBUS, OHIO.—The Big Four Railroad Company has equipped its lines between Columbus and Cincinnati with telephones and will also install telephones on its lines between Columbus and Cleveland.

WINONA, OHIO.—The Winona Telephone Company contemplates making important extensions.

EDINBORO, PA.—The Mutual Telephone Company recently sustained a heavy loss by fire.

GUANAJUATO, MEX.—Messrs. Geo. W. Bryant, Jose Bustament and Nemecio Ponce have been granted permission by the Governor of the State of Gonzales to install a telephone system in this city.

PACHUCA, MEX.—The National Telephone Company of this city is preparing to make important improvements and extensions in this section.

MONROE, WIS.—At their annual meeting the stockholders of the Monroe Telephone Company decided to merge this company with the United Telephone Company, also of this place. The Monroe company operates the local plant and the United company has extensive toll lines throughout the adjoining territory.

COLUMBUS, OHIO.—The Morgan telephone properties in Ohio, outside of Dayton and Toledo, over which G. R. Johnston of this city was recently appointed general manager, includes the following companies: United States Telephone Company, Columbus Citizens' Telephone Company, the London Home Telephone Company, Franklin County Home Telephone Company, Washington Home Telephone Company, Citizens' Telephone and Message County, Columbiana County Telephone Company, Findlay Home Telephone Company, Lancaster Telephone Company, Massilon Telephone Company, Stark County Telephone Company, Youngstown Telephone Company and the Zanesville Telephone and Telegraph Company.

MANSFIELD, OHIO.—The Bell Telephone Company, it is stated, has decided to expend between $200,000 and $300,000 in the construction and equipment of a new building for its plant in this city.

ONONDAGUA, N. Y.—The Onondagua Independent Telephone Company will spend $150,000 in the extension of its local and long distance service in the near future. Alexander H. Cowie is president of the company.

PORTLAND, ORE.—The Home Telephone Company is planning to spend in the neighborhood of $700,000 in extending its lines during the present year. W. H. Wilcox is manager of the company.

SOUTHPOINT, N. C.—The Southpoint Telephone Company has been purchased by the Piedmont Telephone Company.

PENDLETON, ORE.—A deal has been consummated whereby the Interstate Telephone Company has taken over the system of the Eastern Oregon Telephone Company, the consideration being between $45,000 and $50,000.

HOOD RIVER, ORE.—A majority of the stock of the Home Telephone Company has been acquired by Charles Hall and E. O. Hall. The company has a monopoly of the local field, having 1,117 telephones in use.

LITTLE ROCK, ARK.—The Little Rock Telephone Company will make extensive improvements and extensions during the present season.

MAMMOTH SPRINGS, ARK.—The Mustin Telephone Company of Koskonong, Mo., has purchased the Hynson Brothers' Telephone Company.

ROCK ISLAND, ILL.—The Central Union Telephone Company contemplates the erection of a $50,000 telephone exchange in this city.

LAGRANGE, IND.—The Northern Indiana & Southern Michigan Telephone Company will install a new system in this city.

BAY CITY, MICH.—The Valley Telephone Company is considering the expenditure of about $160,000 for the improvement of its system.

MAYSVILLE, KY.—A petition was filed recently asking that a receiver be appointed to take charge of the properties of the Maysville Telephone Company.

PIPESTONE, MINN.—Emil Benson and Thomas Hollen, president and secretary, respectively, of the South Dakota Rural Telephone Company, have purchased the local exchange at Jasper and the rural line extending from Jasper to Trosky.

WHITEHALL, MONT.—The Montana Co-operative Telephone Company of this place was recently acquired by the Montana Independent Telephone Company.

ROCK RAPIDS, IOWA.—The Rock Rapids Telephone exchange, owned and operated by W. C. Wyckoff & Company, has been sold to the Western Electric Telephone Company for a consideration of $19,000.

OMAHA, NEBR.—Lysle Abbott has been appointed receiver of the Omaha Independent Telephone Company by order of Judge W. H. Munger of the federal court. Mr. Abbott states that the company will at once complete the South Omaha and Florence exchanges and will build up the Omaha exchange from 15,000 to 20,000 telephones. Application for receiver was made by the Title Insurance & Trust Company, Los Angeles, which holds two mortgages of $3,000,000 each.

OMAHA, NEBR.—G. E. McFarland, general manager of the Nebraska Telephone Company, announces that his company plans an expenditure of about $1,250,000 on the work of construction and reconstruction in Omaha and throughout the state. Nearly 1,000 miles of additional pole lines will be reconstructed and about 2,000 miles of additional copper toll lines will be built.

ALAMAGORDO, N. M.—The local system of the Alamagordo Telephone Company has been purchased by the Tri-State Telephone & Telegraph Company, recently incorporated at El Paso, Texas.

OGDEN, UTAH.—The Rocky Mountain Bell Telephone Company announces that it will make improvements calling for an expenditure of $60,000.

MEMPHIS, TENN.—The Memphis Telephone Company contemplates extensions which will mean an expenditure of over $50,000. The company will make an effort to secure permission to build lines across the Mississippi river. It is proposed to cross the river with aerial lines, towers for which will be built on either side. R. H. Polk is general manager of the company.

WICHITA FALLS, TEXAS.—The Wichita Falls & Northwestern Telephone Company has been purchased by the Pioneer Telephone Company of Oklahoma City, Okla.

WENATCHEE, WASH.—Z. E. Lanham, president of the Farmers' Telephone Company of this city, is preparing to erect a $30,000 building for the telephone system. The company has 1,300 local subscribers.

HOUSTON, TEXAS.—The Houston Home Telephone Company has been reorganized by the following: H. H. Huntington of California; C. E. Graham, New York City; Harden Meyers, Covington, Ky.; H. G. Pillot, Houston. F. E. Ebersole, a well known telephone man of Omaha, has received the contract for construction.

LAKE CITY, IOWA.—The Central Mutual Telephone Company is erecting a new exchange building at a cost of $10,000. Later the system will be changed to underground cable system, entailing a total expenditure of about $20,000.

FT. WAYNE, IND.—Henry W. Soest of this city has purchased the Geiger Telephone System at Cherubusco for $20,000. The system has seven hundred patrons and maintains exchanges at Cherubusco, Huntertown, LaOtto and Green Center, with many farm lines. It is said the purchase was made merely as an investment.

HANNIBAL, MO.—The directors of the Bluff City Telephone Company have authorized the expenditure of from $5,000 to $6,000 for the purchase of a switchboard and the extension of its lines.

CULBERTSON, MONT.—At a special meeting of the directors of the Monata Star Telephone Company a deal was closed for a loan of $15,000, to be used in extending its lines.

BALLINGER, TEXAS.—The West Texas Telephone Company has purchased a site on which it will erect a new exchange building. Many other improvements will be made, entailing an expenditure of something like $35,000 or $40,000.

KAYSVILLE, UTAH.—It is the intention of the Davis County Independent Telephone Company to deal in electrical energy in addition to operating a telephone system, hence it has been decided to change the name to the Home Telephone & Electric Company and to increase the capital stock from 25,000 to $40,000.